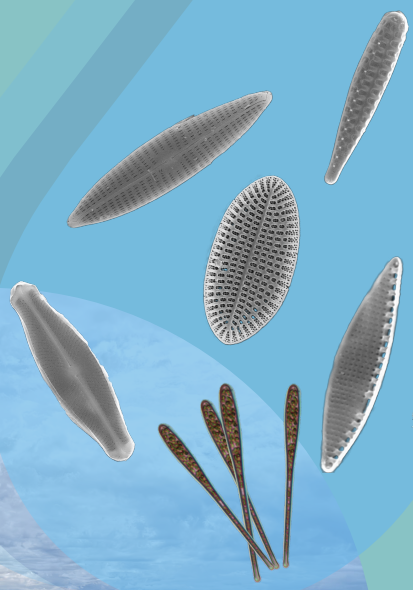
XVI European Diatom meeting

Murcia, 6–10 July 2026



ORGANIZED

UNIVERSIDAD DE MURCIA

LABORATORIO DE ALGOLOGÍA Universidad de Murcia

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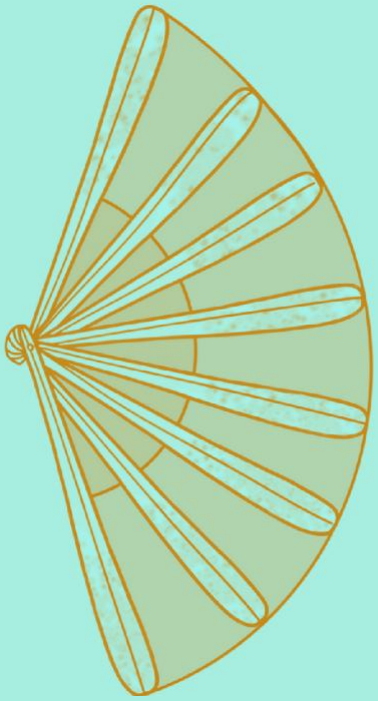

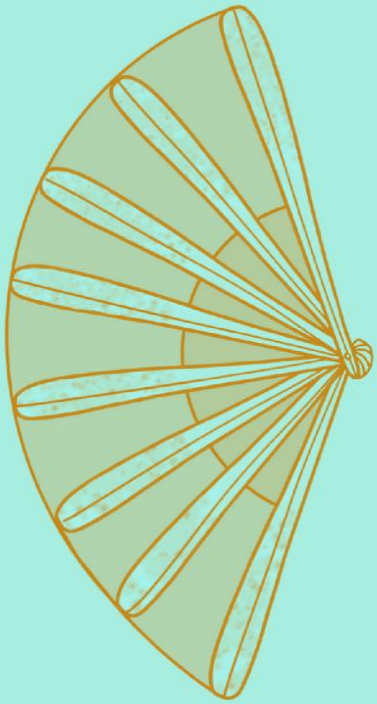

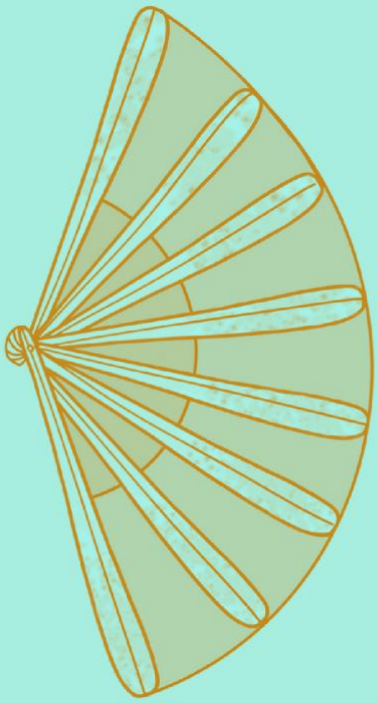

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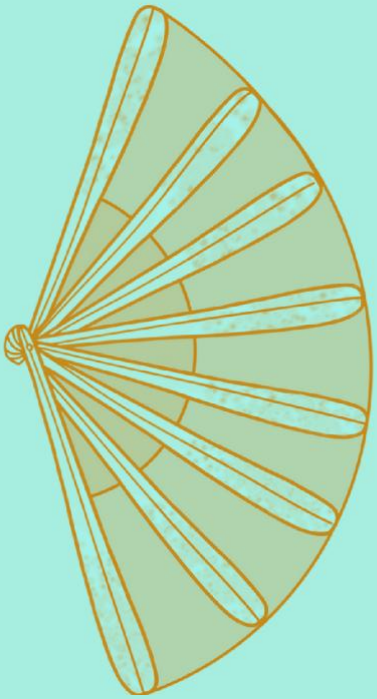

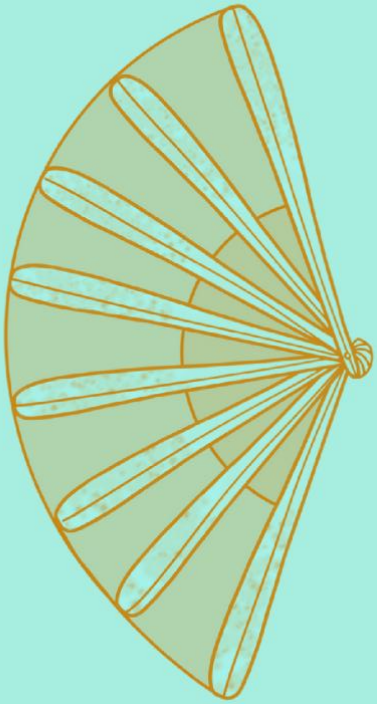

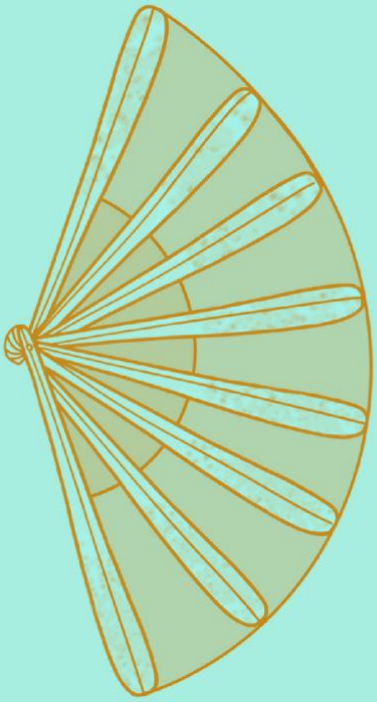

COMMITTEES

Organizing Committee

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- **Saúl Blanco**, University of León, Spain
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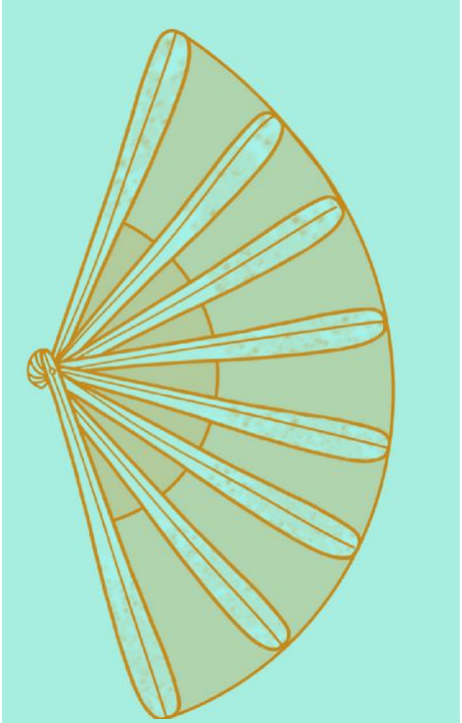
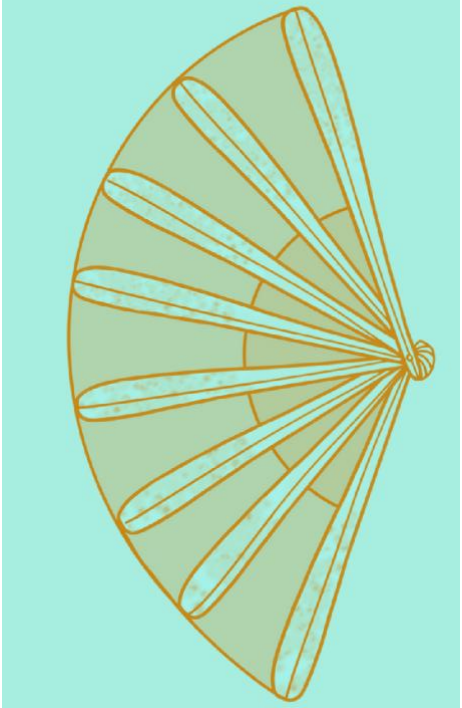
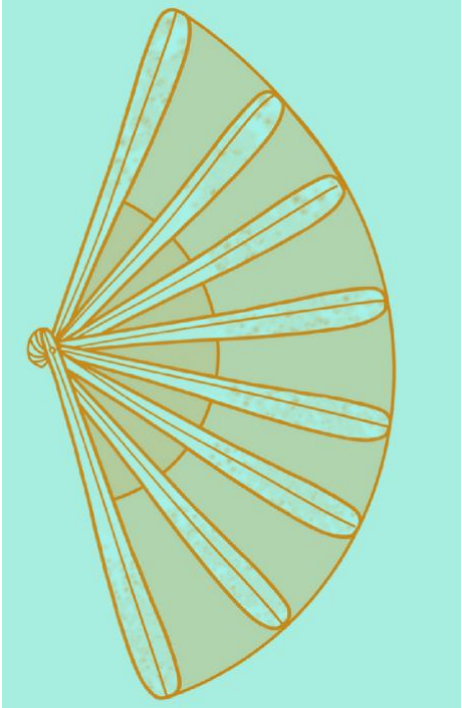






SCIENTIFIC PROGRAMME

July 6th		
Time	**Event**	**Venue**
08:00 - 18:00	XVI EDM Registration	Paraninfo - *Campus La Merced*
09:00 – 12:00	*The genera Pseudostaurosira and Nanofrustulum in Europe: a morphological and taxonomic overview of all reported species* Presenter: Bart Van de Vijver*, Margaux Pottiez* & Carlos E. Wetzel	Room Jorge Guillén *Campus La Merced*
10:00 – 13:00	*Confocal Microscopy for Diatom Research: Principles and Applications* Presenter: Mª Teresa Coronado-Parra	Servicio de Microscopía (SACE) *Campus de Espinardo*
09:00 – 12:00	*Digital diatomology and intercalibration* Presenters: Michael Kloster & Andrea-Burfeid-Castellanos	Room Mariano Baquero *Campus La Merced*
15:00 – 18:00	*The genera Pseudostaurosira and Nanofrustulum in Europe: a morphological and taxonomic overview of all reported species* Presenter: Bart Van de Vijver*, Margaux Pottiez* & Carlos E. Wetzel	Room Jorge Guillén *Campus La Merced*
	Exploring diatom morphology with Field Emission SEM Presenter: Mª Teresa Coronado-Parra	Servicio de Microscopía (SACE) *Campus de Espinardo*
	Diatom ecology through lenses of OPEN and FAIR practices Presenter: Xavier Benito	Room Mariano Baquero *Campus La Merced*
18:00 – 19:00	Young ISDR presentation + Early Career Researchers (ECRs) networking	Aula (01) Aulario *Campus La Merced*
20:00	Welcome reception	Ayuntamiento de Murcia (*City Hall*)

July 7th		
8:30 - 9:30	**Plenary Lecture - Paraninfo** *The life of marine benthic diatoms in intertidal sediments* Graham J.C. Underwood, University of Essex, United Kingdom	
	PARANINFO	**HEMICICLO**
Session I	**Chairs: Manel Leira & María Cid**	**Chairs: Rafał M. Olszyński & Gillaume Marec**
9:30 - 9:45	*Biodiversity and long-term change in diatom assemblages from streams in the Nepalese Himalaya* Ingrid Jüttner, Smriti Gurung, Ian Vaughan, Steve Ormerod, Eileen J. Cox, David M. Williams, Bart Van de Vijver, Carlos E. Wetzel & Dean Jabobsen	*What exactly is 'Integrative Taxonomy': Hemiaulus, Hemiboscia and the Geography of Extinction* David M. Williams & Pat A. Sims
9:45 - 10:00	*Multi-Scale Assessment of Water Quality in a Human-Impacted Southwestern Mediterranean Watershed Using Benthic Diatom Bioindicators* Soulaima Azizi, Sondes Melliti Ben Garali, Kaouther Mejri Kousri, Mustapha Béjaoui, Anne Eulin-Garrigue, Abdelhafidh Khazri, Marco Cantonati & Asma Sakka Hlaili	*Multigene phylogeny and ultrastructure of Entomoneis: bridging evolutionary and taxonomy gaps using cultivated strains* Maja Mucko, Sunčica Bosak, Filip Grgurević; Matt P. Ashworth, Thomas A. Frankovich, Andrea Prijić, Sara Buduljak, Ivana Panjkrc, Marija Gligora Udovič, Petra Peharec Štefanić & Zrinka Ljubešić
10:00 - 10:15	*Natural or anthropogenic? What drives diatom communities in an urban tropical monsoon-driven river basin?* Pratyasha Nayak & Karthick Balasubramanian	*Diversity and Integrative Taxonomy of Marine Benthic Diatoms from Tropical Sulawesi, Indonesia* Sulastri Arsad, Małgorzata Bąk & Romain Gastineau
10:15 - 10:30	*Taxonomic structure of phytoplankton and phytobenthos, with special emphasis on bioindicator diatoms, in rivers of the Southern Pantanal (MS, Brazil)* Lidia Baitiche, Maria Dolores Sendra, Hélina dos Santos Nascimento, Alexeia Barufatti, Amanda Nunes de Morais, Marcus Vinicius Santiago Urquiza, William Marcus da Silva, Rebeca Pérez & Eduardo Vicente	*The tip of the iceberg: combining phylogenetics, metagenomics, and reproductive experiments to unravel the diversity and biogeography of the marine diatom genus Cylindrotheca* Anne-Laura Monten, Yuhao Tong, Zoltán Füssy, Roksana Majewska, Andrew Allen, Wim Vyverman, Gust Bilcke, Heroen Verbruggen & Eveline Pinseel
10:30 – 11:00	Coffee Break	

Session II	Chairs: Ingrid Juttner & Sulaima Azizi	Chairs: Maja Muczo & Sulastri Arzad
11:00 - 11:15	*Assessing European urban stream One Health using diatoms: impacts of climate change and potential rehabilitation* Salomé FP Almeida, Rafael Schmitt, António Chen, Ana R. Calapez, Marcos Dias, Fernanda Rodrigues, Dirk S. Schmeller, Rayan Bouchali, Nadia Piscopo, Luigi Esposito, Andrée De Cock, Marie A.E. Forio, Peter Goethals, Anne Moen, Silje H. Henni, May Linn Bokma Mørch & Maria João Feio	*Elucidating the molecular mechanisms underlying thermal niche differentiation in the Cylindrotheca closterium complex* Guillaume Marec, Svitlana Lukicheva, Daan Deleu, Gust Bilcke, Eveline Pinseel, Klaas Vandepoele, Jana Asselman & Koen Sabbe
11:15 - 11:30	*Enhanced water-level fluctuations due to artificial snow production reduce diatom diversity and threatened Red List species in a high-mountain lake of the south-eastern Alps* Marco Cantonati, María Cid-Rodríguez, Nicola Angeli, Abdullah A. Saber, Hassan A. Rudayni & Daniel Spitale	*Polyphasic characterization of Planothidium strains without a sinus or cavum isolated from streams in California, USA* Rosalina Stancheva Christova, Laura Aycock, Marina Potapova, Nélida Abarca, Wolf-Henning Kusber, Oliver Skibbe, Jonas Zimmermann, Kalina Manoylov & Regine Jahn
11:30 - 11:45	*Integrating Physicochemical Parameters and Benthic Diatoms to Assess Water Quality in Degraded Mediterranean Surface Waters* Soulaima Azizi, Sondes Melliti Ben Garali, Kaouther Mejri Kousri, Anne Eulin-Garrigue, Marco Cantonati & Asma Sakka Hlaili	*Taxonomic study on two new Luticola species inhabiting Korean tidal flats* Yebin Jeon, Jinsoon Park, Minseop Kim, Hyesuk Kim & Yangrae Rho
11:45 - 12:00	*Contrasting effects of torrentiality and flow regulation on diatom metacommunity dynamics in Mediterranean rivers* Manel Leira, Sergi Sabater & Elisabet Tornés	*Halamphora diversity in Turkish Coasts* Cüneyt Nadir Solak, Paul Hamilton, Kalina Monoylov, Tolga Çetin, Alper Uğurluoğlu, Elif Yılmaz, Nesil Ertorun, Buse Özalp, Yelda Aktan, Haşim Sömek, Tuğba Ongun Sevindik, Neslihan özdelice, Turgay Durmuş & Seher Dirican
12:00 - 12:15	*Environmental history of Lake Moo (Northern Apennines, Italy) and of its catchment since the last phase of the Little Ice Age as reconstructed from diatom analysis of lake sediments* María Cid-Rodríguez, Stefano Segadelli, Yago Nestola, Daniel Spitale, Soulaima Azizi, Abdullah A. Saber, Lorca Jaber & Marco Cantonati	*A multiscale spatial characterization reveals the main environmental factors shaping diatom communities in marine biofilms* Abel Barre, Marc Bouchoucha, Raphaëlle Barry-Martinet, Nicolas Briant, Vincent Baccher, Bruno Dormoy, Pierre Boissery, Annick Ortalo-Magne & Jean-François Briand

12:15 - 12:30	*Small Island, Global Connections: Remarkable Diatom Findings from an Isolated Island in the Northwest Pacific* Yangrae Rho, Hyesuk Kim & Jinsoon Park	*Hidden diversity of Nitzschia in the Bogdałów post-mining reservoir revealed by integrative taxonomy* Rafał M. Olszyński & Piotr K. Zakrzewski
12:30 - 12:45		*What constitutes a stigma? A review of isolated pore structures in raphid diatoms* Bart Van de Vijver & Eileen J. Cox
13:00 - 15:00	Lunch Break	
15:00 - 16:30	Claustro de derecho - **Poster session***	
17:00	Paraninfo - Red de Diatomistas Hispanohablantes Presentation	

*Poster Session

Marine Ecology

P1 *"Marine Benthic Diatom Diversity in the Adriatic Sea: A Synthesis of Current Knowledge"* **Ana Car, Aydin Kalel, Iris Dupčić Radić & Nika Pasković**

P2 *"Spatial distribution of diatom communities along a transect in the open Southern Adriatic Sea"* **Nika Pasković, Iris Dupčić Radić, Ana Car, Rade Garić & Marija Rusković**

P3 *"Morphological, molecular and genomic investigations of the biodiversity of diatoms from the Can Gio Mangrove Biosphere Reserve, Vietnam"* **Van Duy Nguyen, Romain Gastineau & Duc Hung Nguyen**

P4 *"Benthic diatom flora from the Mar Menor coastal lagoon (SE Spain): biodiversity hotspot in a eutrophicated transitional system"* **Yerai Gómez-Leyva, María Dolores Belando & Marina Aboal**

P5 *"Diatom abundance and diversity in shallow coastal sediments along the Swedish coast"* **Erik Browaldh, Pauline Snoeijs Leijonmalm, Martin Dahl & Elinor Andrén**

P6 *"The burden of multiple stressors; how microphytobenthic diatom communities respond to increasing numbers of pollutants"* **Toms Ekmanis, Melanie Chocholek & David M. Paterson**

Paleolimnology

P7 *"Early Holocene diatom assemblages in Lithuanian lakes exhibit regionally synchronous shifts"* **Giedrė Vaikutienė, Liudas Daumantas, Laura Gedminienė & Jonas Satkūnas**

P8 *"Holocene Diatom Records of Environmental and Climate Changes in the Hassi Mouina depression (NW Great Western Erg, Algeria)"* **Bachiri Noureddine, Mansour Bouhameur, Mennad Saci, Hammadai Ali, Yahiaoui Nassima, Cüneyt Solak, Mammeri Cheikh & Nesil Ertorun**

P9 *"Environmental change in Holocene lacustrine deposits of Hassi Manda in the Erg Er Raoui (Algerian Sahara Desert) based on diatom análisis"* **Ali Hamadai, Mansour Bouhameur, Paul Brian Hamilton, Cüneyt Nadir Solak, Abdullah A. Saber & Nesil Ertorun**

P10 *"Diatom-Based Reconstruction of Hydrological Changes in Pre-Hispanic Canal-Camellón Systems of the Mompos Depression (Colombia)"* **Mª Carmen Trapote, Núria Cañellas-Boltà & Encarni Montoya**

P11 *"Seasonal dynamics of diatom assemblages in sediment traps at contrasting depths in Lake Sanabria (NW Spain)"* **Manel Leira, Ana Isabel Negro & Manuel Toro**

Freshwater Ecology

P12 *"Diatoms as indicators of environmental changes in high-elevation streams and lakes influenced by rock glaciers"* **Lukasz Peszek, Andreas Bruder, Andres Grolimund & Sofie Bruni**

P13 *"How do diatoms adapt to warmer climates? Investigating thermal niche shifts and the role of gene expression evolution"* **Eléonore Pottier, Willem Stock & Eveline Pinseel**

P14 *"Assessing Water Quality in Mediterranean Wetlands Through Diatom Assemblages"* **Adriana Olenici, Irene Medina & Francisco Jiménez-Gómez**

P15 *"Deciphering the spatio-temporal expansion of non-indigenous diatom species in major Iberian river basins (2001–2024)"* **Núria Flor Arnau, Manel Leira & Toni Monleón-Getino**

P16 *"Diatom community structure and bioindicator significance in the Southern Mediterranean semi-arid region: Cheliff Reservoir (Northwest Algeria)"* **Lidia Baitiche, Maria Dolores Sendra, Eduardo Vicente & Juan M. Soria**

P17 *"Microhabitat filtering structures diatom community assembly in Coeur d'Alene Lake, Idaho, USA"* **Hirak Parikh, Ben D. Scofield, Craig Cooper, Jyoti Verma, Daniel G. Gavin & Jeffery Stone**

P18 *"Diatom community structure along physicochemical gradients in siliceous Atlantic rivers: insights from the Mero basin (A Coruña, Galicia, NW Iberian Peninsula)"* **Elena Rodríguez Santos, Manuel Pimentel Pereira & Manel Leira Campos**

Saline habitat taxonomy

P19 *"Contribution to the diversity of taxonomically problematic small fragilarioid diatoms from a thermomineral spring in Serbia"* **Ana Milićević, Slađana Popović, Bart Van de Vijver & Olga Jakovljević**

P20 *"Diatoma species from saline habitats (Vojvodina Region, Serbia)"* **Danijela Vidaković, Ljubica Vlaović, Frederic Rimet, Jelena Krizmanić, David Williams, Jelena Avdalović & Zlatko Levkov**

P21 *"In search for the identity of Halamphora kolbei (Aleem) Álvarez-Blanco & S.Blanco: analysis of the type material of Amphora incrassata Giffen and comparisons with populations of H. kolbei – group"* **Margaux Pottiez, Sunčica Bosak, Elya P. Pane, Abdullah A. Saber, Cüneyt N. Solak, Paul B. Hamilton, Yenny Risjani & Ralitsa Zidarova**

P22 *"A new Halamphora taxon from Hailuoto Island, Finland"* **Viktoriia Berezovska, Paul Hamilton, Ferhan Yedidağ & Cüneyt Nadir Solak**

P23 *"Diversity of marine benthic diatoms on macrophytes in coastal waters prone to blooms of the toxic dinoflagellate Ostreopsis"* **Adrian Kryk, David G. Mann, Emilio Soler-Onís, Magda Vila, Elisa Berdalet & Rosa Trobajo**

Freshwater Taxonomy

P24 *"Noteworthy and potentially new Adlafia species from Croatia and North Macedonia"* **Antonija Kulaš, Marija Gligora Udovič, Dunja Jurina, Lina Kovačević, Manuela Spevec, Petar Žutinić & Zlatko Levkov**

P25 *"The Staurosira venter enigma finally revealed? Evidence from historic material"* **Bart Van de Vijver, Agata Wojtal & David M. Williams**

P26 *"Diatom flora in a channel fed by Lake Biwa on the campus of the University of Shiga Prefecture, Japan"* **Akira Hatanaka**

P27 *"Extremophilic Nitzschia species in a Man-Made Environment: Phylogenetic Link to Crimean Volcanic Isolate"* **Rybak Mateusz, Peszek Łukasz & Górecka Ewa**

P28 *"Odontidium or Diatoma – that is the basic question, an integrative approach to morphological and molecular data"* **Julia Sulkowska, Joanna Żelazna-Wieczorek & Rafał M. Olszyński**

P29 *"A study of Amphora bigibba Grunow - species complex: the identity of Amphora binodis Gregory"* **Margaux Pottiez & Ralitza Zidarova**

P30 *"A new taxon from El Macta marhs in Algeria"* **Ali Hamadai, Paul Hamilton, Mansour Bouhameur, Semiha Şahan & Cüneyt Nadir Solak**

P31 *"Morphological characterisation of an Aulacoseira species (Aulacoseiraceae) from a soft-water lake in northwestern Spain"* **Ana I. Negro & Manel Leira**

P32 *"First record of a centric diatom Pantoscekiella in the Holocene lacustrine deposits of the Great Western Erg (Sahara, Algeria)"* **Mansour Bouhameur**

Miscelanea

P33 *"www. diatomatlas.mk – A new internet source for diatom taxonomy and ecology"* **Andrej Levkov, Danijela Mitiić Kopanja & Zlatko Levkov**

P34 *"Soil Diatoms – New insights into their diversity and their application as bioindicators for the soil ecological status"* **Katherina Schimani, Konrad Schultz, Nélida Abarca, Wolf-Henning Kusber, Oliver Skibbe, Lara R.** Prelle, Valentina Savaglia, Ulf Karsten & Jonas Zimmermann

P35 *"Towards a standardized sample size for morphometric descriptions"* **Saúl Blanco**

P36 *"Progress with the Diatom Flora of Britain and Ireland"* **Ingrid Jüttner, David M. Williams, Edgley Cesar, Eileen J. Cox, Gianfranco Novarino & Martyn Kelly**

July 8th

8:30 - 9:30	**Plenary Lecture - Paraninfo** *Genomic insights into the speciation and adaptation of diatom* Eveline Pinseel, University of Ghent, Belgium	
	PARANINFO	**HEMICICLO**
Session I	**Chairs: Éva Ács & Jean-Francois Briand**	**Chairs: Anna Ticha & Nuria Flor**
9:30 - 9.45	*Coupling morphology and metabarcoding reveals diatom community structure across Florida (USA) coastal waters* Juan José Pierella Karlusich, Frank E. Muller-Karger, Katherine Silliman, Rosalyn Trinh, Luke R. Thompson & Enrique Montes	*OrgaCount: An online tool for processing diatom data within an integrated platform* Dushica Zaova, Thomas Raabe, Cordula Maguire & Ardelean Adorian
9:45 - 10:00	*Metabarcoding Reveals Spatio-temporal Variation of Intraspecific ASVs and Ecological Types in Pseudo-nitzschia* Chisato Nakaji, Akihiro Futakabu & Shinya Sato	*From AI models to reproducible web workflows: standardized microscopy-based analysis for freshwater and marine diatoms* Gloria Bueno, Maria Blanco, Lucía Sánchez, Jesús Ruiz-Santaquiteria & Gabriel Cristóbal
10:00 - 10:15	*The Villainous Diatoms: unveiling Pseudo-nitzschia spp. in Irish waters through molecular screening and quantification* Nicole Caputo, Dave Clarke, Fiona Kavanagh & Luca Mirimin	*Improving European biodiversity research – diatom digital imaging in DNAqualMG* Michael Kloster, Dina Abdelmguid, Andrea Burfeid Castellanos, Benoit Paix, Maxime Beauvais, Frédéric Rimet, M. Kahlert & B. Beszteri
10:15 - 10:30	*Armchair biogeography: the emerging contributions of metabarcoding to our understanding of marine benthic diatoms* David G. Mann, Rosa Trobajo & Elisa Berdalet	*Diatom Collections: The Pillars of Diatom Research* Andrew-Charles Podzorski, Nélida Abarca, Edgley Cesar, Regine Jahn, Wolf-Henning Kusber, Tanja Schuster, Bart Van de Vijver & David Williams
10:30 - 11:00	Coffee Break	

Session II	Chairs: Shinya Sato & Antonija Kulas	Chairs: Ana Car & Michael Kloster
11:00 - 11:15	*Isolated waters, unique diatoms: metabarcoding insights from island streams* Paula Mendoza-Casanova, Xavier Benito, David Mann, Frédéric Rimet, Benjamin Alric, Clarisse Lemonnier, Núria Cid, Miguel Cañedo, Raúl Acosta, Marlen Vasquez, Eman Calleja & Rosa Trobajo	*Fluorometric Approach for the Measurement of Benthic Diatoms in Biofilms* Detlev Lohse
11:15 - 11:30	*From microscope to metabarcoding: taxonomic gaps, and transition challenges in freshwater diatom biomonitoring in Luxembourg* Carlos E. Wetzel, Demetrio Mora, David Heudre, Cyrille Charles, Sarah Vray, Charlotte Dehu & Lionel L'Hoste	*Implementing the Imaging FlowCytobot in the Gulf of Naples (Mediterranean Sea) for the study of planktonic diatom diversity and ecology* Melpomeni Sofia Mente, Eleonora Scalco, Roberta Piredda, Adriana Zingone & Diana Sarno
11:30 - 11:45	*DNA metabarcoding reveals seasonal shifts in diatom genetic diversity from communities to intraspecific levels* Rafael Schmitt, Aurea Luiza Lemes da Silva, Laurine Viollaz, Frédéric Rimet, Maria João Feio & Salomé F. P. Almeida	*DiatomS mEEt Databases (SEED): resources and practices to enable large-scale ecological research* Xavier Benito, María Luján García, Sabrina Bustos, Sandra Garces-Pastor & the SeeD network
11:45 - 12:00	*One gamete, one genome: generating homozygous clones in Amphora commutata* Shinya Sato & David G. Mann	*DIASPORE: An open bibliographic database synthesizing 180+ years of diatom research in Spanish-speaking countries* Carina Seitz, Manel Leira, Carlos F. Rodríguez-Gómez, Luis Castro-Cera, Amelia A. Vouilloud, Susana Chamorro, Saúl Blanco, Alejandra Goldenver-Vilar, José De García, Cristina Delgado, Einer A. Sepúlveda-Zúñiga, Laura Pérez, Laura Lopera Congote, Liz E. Romero, Carolina Cuña-Rodríguez, Eberto Novelo, Gustavo Baffico & Rosa Trobajo

12:00 - 12:15	*From individual cells to natural populations: uncovering sexual reproduction in centric diatoms using single-cell RNA sequencing and metatranscriptomics* Nadine Rijsdijk, Gust Bilcke, Thomas Eekhout, Michiel Perneel, Rik Debeer, Peter Chaerle, Guillaume Marec, Svitlana Lukicheva, Koen Sabbe, Klaas Vandepoele & Wim Vyverman	*A forensic framework for lossless diatom extraction and quantitative site determination* Tomáš Bešta, Hana Hamrová, Petr Tomášek, Petra Dohnalová, Jana Markvartová, Tomáš Hauer, Tereza Švejdová, Katerina Zubícková, Iva Zagatová, Radek Lefnar, Eva Tomášková & Jan Kaštovský
12:15 - 12:30	*Evolutionary specialization and canalization within the family Stauroneidaceae* Elena Jovanovska & Karolina Masarova	
13:00 – 15:00	Lunch Break	
15:00 – 16:00	Paraninfo - Flash Talks	
16:00 – 17:30	Claustro de derecho - **Poster session***	
17:30 – 18:00	Campus Garden Flash Talks Wrap-Up (refreshments sponsored by Young ISDR)	

**Poster Session*

Genomics

P37 *"Tiny but Important" – Benthic Diatoms of the Baltic Sea (BENKIESO): Developing the Foundations for Innovative Biodiversity Monitoring Methods Using eDNA and AI-Assisted Image Analysis"* **Jonas Zimmermann, Bánk Beszteri, Ulf Karsten, Dimitra Ketesidou, Michael Kloster, Jan Kollár, Lara R. Prelle, Katherina Schimani & Konrad Schultz**

P38 *"Exploring Diatom Biodiversity on the Polish Baltic Coast Using Molecular and Microscopic Methods"* **Ewa Górecka, Przemysław Dąbek, Elif Yilmaz, Romain Gastineau, Van Duy Nguyen & Agnieszka Kierzek**

P39 *"Optimizing Diatom Identification: A Comparative Analysis of Genomic Classifiers, Sequencing Approaches, and Reference Databases"* **Daniel Munzón, Josep Piñol, Miquel Àngel Senar, Jordi Catalan, Elena Fagin & Marisol Felip**

P40 *"Trait–Environment interactions provide evidence for key evolutionary innovations in Diploneis from Lake Tanganyika"* **Karolina Masarova & Elena Jovanovska**

P41 *"Four High-Quality Reference Genomes Expand Genomic Resources for Pennate Diatoms"* **Daan Deleu, Svitlana Lukicheva, Guillaume Marec, Anne-Laura Monten, Gust Bilcke, Wim Vyverman, Koen Sabbe, Klaas Vandepoele & Eveline Pinseel**

P42 *"DNA-based validation of hydromorphological typology based on phytobenthic communities in rivers and lakes"* **Éva Ács, Zsuzsa Trábert, Judit Knisz, Balázs Tibor Kunkli, Katalin Nagy, Tibor Bíró, Tihamér Keve Kiss, Edit Vadkerti & Gábor Várbíró**

Collections and Intercalibrations

P43 *"Observation on the genus Microcostatus Johansen & Sray (Bacillariophyceae) in Macedonia"* **Danijela Mitic' Kopanja, Mateusz Rybak & Zlatko Levkov**

P44 *"Digital diatom taxonomic intercalibration and harmonization – Lessons learned from the first exercise"* **Michael Kloster, Dina Abdelmguid, Andrea Burfeid Castellanos, Marco Cantonati, Elisa Falasco, Eva Herlitz, David Heudre, Martyn Kelly, Zlatko Levkov, Juha Miettinen, Rafal Olszyński, Benoit Paix, Bart Van de Vijver, Geurt Verweij, Danijela Vidakovic, Maria Kahlert, Frédéric Rimet & Bánk Beszteri**

P45 *"The Central Collection of Algal Cultures (CCAC) at the University of Duisburg-Essen"* Olga **Matantseva, Andrea M. Burfeid Castellanos & Bánk Beszteri**

P46 *"Diatom dictionary: enabling taxonomy harmonization through reproducible workflows"* **Xavier Benito & Anna Tichá**

P47 *"Connecting Diatom Collections: a first step"* **Nélida Abarca, Edgley Cesar, Regine Jahn, Wolf-Henning Kusber, Andrew-Charles Podzorski, Tanja Schuster, Bart Van de Vijver & David Williams**

P48 *"Ensuring Reproducibility and Taxonomic Consistency in Diatom Analysis: Intercomparison Exercises"* **Pepita Nolla-Querol, Núria Llauradó-Nolla & Lu Vilaseca Juan**

P49 *"Towards a diatom reference collection in the Canary Islands: integrating cultures, morphology, and genetics"* **Irene Cáceres Barrera, Mariano Nicolás Hernández Ferrer, Marta Sansón & Nereida María Rancel Rodríguez**

Forensic Sciences and other applications

P50 *"Diatoms and other siliceous microorganisms as complementary forensic indicators in drowning diagnosis"* **Merle Dorsch**

P51 *"Sequential Deep Eutectic Solvent Fractionation of Diatom Biomass: Towards Integrated Recovery of Frustules and Organic Compounds"* **Filipe Vinagre, Carl Edsbagge, Simon Nilsson & Angela Wulff**

P52 *"Evaluation of dual-yield potential of lipid and silica co-production in Craspedostauros sp."* **Carl Edsbagge**

P53 *"Analysis of Diatoms in Animal Tissues as a Forensic Tool"* **Ylenia López-Molina, Teresa Coronado-Parra & Marina Aboal**

P54 *"Can diatoms power the future of nanocomposites?"* **Przemysław Dąbek, Piya Roychoudhury, Aleksandra Golubeva, Ewa Górecka, Rahul Bose & Andrzej Witkowski**

July 9th		
8:30 - 9:30	**Plenary Lecture - Paraninfo** *Unraveling diatom communities in temporary rivers: taxonomic and functional perspectives* Helena Novais, University of Évora, Portugal	
	PARANINFO	**HEMICICLO**
Session I	**Chairs: Salomé Almeida & David Williams**	**Chairs: Hristina Kochoska & Cüneyt Nadir Solak**
9:30 - 9.45	*Ecology of Diatom Communities in Mediterranean Disconnected Pools* Guillermo Quevedo-Ortiz, Saúl Blanco, Nuria Cid, Julien Crabot, Zeynep Ersoy, Pau Fortuño, Zulema Freixinos, Zulema Gonzalez-Saldias, Manuel Jesús López-Rodríguez, Nuria López-Rodríguez, Eva Pérez-Lajarín, Mariano Piñero-Fernández, Frédéric Rimet, Nuria Robles., María del Mar Sánchez Montoya, Carlos Sánchez-Campaña, Jua Sánchez-Nogueras, María Soria, Juan Manuel Tierno de Figueroa, Martiano Verdugo Althöfer, Joan Gomà & Nuria Bonada	*Strong spatial structuring of diatom communities across Antarctic cryoconite holes.* Raquel Viso, Jan Kollár, Kateřina Kopalová, Linda Nedbalová, Josef Elster, Flavia Dory, Barbara Leoni, Carla Puigdomenech, Diane M. McKnight & Tyler J. Kohler
9:45 - 10:00	*The diatom side of a toxic dinoflagellate bloom: diversity, dynamics, and indicators from a Mediterranean reef* Rosa Trobajo, Adrian Kryk, Alba Garriga, Elisa Berdalet, Sofía Ibáñez, Magda Vila & David G. Mann	*Reading the soil through diatoms: The SDI (Soil Diatom Index) as a scalable biomonitoring framework* Carlos E. Wetzel, Frederic Rimet & David G. Mann
10:00 - 10:15	*From the Atlantic to the Mediterranean: how environmental factors, colonisation kinetics and polymer type shape diatom diversity in the plastisphere* Abel Barré, Véronique Lenoble, Ana Luzia Lacerda, Maria Luiza Pedrotti, Raffaella Casotti, Carola Murano, Vincenzo Donnarumma, Soledad Muniategui-Lorenzo, José M. Andrade-Garda, Verónica Fernández-González, Carmen Moscoso-Pérez, Felipe Kessler, Róisín Nash, Fanny Aulanier, Raphaëlle Barry-Martinet, Marc Bouchoucha, João Frias & Jean-François Briand	*Revision and validation of the MDIAT for ecological status assessment of coastal rivers in Galicia (NW Spain)* Cristina Delgado, María Cid-Rodriguez & Isabel Pardo

10:15 - 10:30	*Epiphytic diatoms associated with the invasive alga Sargassum muticum* Natalie Reali, Angela Trocino, José Maria Monserrat & Dariano Krummenauer	*Implementing Freshwater Protected Areas: Integrating Ecological Indicators, Governance and Policy Frameworks* Helena I. L. Valentim, Salomé F. P. Almeida, Sérgio Bruno de Araújo Gonçalves da Costa, Simone da Graça Pinto Varandas, Luciano F. A. Montag, Francisca C. Aguiar, Ana Filipa Filipe, Pedro Macedo, Virgílio Hermoso, Isabel Pardo, Núria Bonada, Sergi Sabater, Ronaldo Sousa, Renata Ruaro, Gorazd Urbanič, Marcos Callisto, Daniele Jovem-Azevêdo, Joaquim Jesus, Joseline Molozzi, Marie Anne Eurie Forio, Simon Linke, Juliette Tison-Rosebery, Rui M. V. Cortes, Sara C. Antunes, Carlos Bernardo Mascarenhas Alves, Evaldo de Lira Azevêdo, Ana Raquel Santos Agra & Maria João Feio
10:30 – 11:00	Coffee Break	
Session II	**Chairs: David G. Mann & Carlos E. Wetzel**	**Chairs: Joan Gomá & Elena Pérez- Rubín Jiménez**
11:00-11:15	*Seasonal dynamics of benthic diatom communities in saline lakes: a metabarcoding and microscopy approach* Ljubica Vlaović, Antonija Kulaš, Clarisse Lemonnier, Frédéric Rimet & Danijela Vidaković	*Beyond structure and energy storage - exploring the functions of extracellular diatom polysaccharides* Leonard Rößler & Jan-Hendrik Hehemann
11:15-11:30	*Climate-driven alterations in arctic light regimes reshape diatom physiology and phenology* Jordan Toullec, Johann Lavaud & Brivaëla Moriceau	*Quantifying single-cell elemental quotas of diatoms to assess biogeochemical export fluxes in the Denmark Strait* Irene Llamas-Cano, Mariona Segura-Noguera, Andrés S. Rigual-Hernández, David Amblas & Anna Sanchez-Vidal
11:30-11:45	*Shrinking glaciers shape Alpine glacier-fed stream diatom communities: Insights from DNA metabarcoding* Hristina Kochoska, Jan Kollár, Kateřina Kopalová, Michael Styllas, Leïla Ezzat, Grégoire Michoud, Hannes Peter, Susheel Bhanu Busi, Tom J. Battin, & Tyler J. Kohler	*Small warming, big shift: temperature-induced transition from carbon sink to source for in diatom-dominated intertidal sediments along European shorelines* Jérôme Morelle, Audrey Teillet, Vincent Le Fouest, Philippe Rosa, João Sérôdio, Bruno Jesus, Koen Sabbe, Daphne van der Wal, Ana Sousa, Sokratis Papaspyrou, Alfonso Corzo, Vona Mélédér & Johann Lavaud

11:45-12:00	*Biogeographic Contrasts in Soil Diatoms: from Antarctic Endemism to Bipolar Distribution* Daan Deleu, Wade R. Roberts, Andrew J. Alverson, Wim Vyverman & Eveline Pinseel	*Exploring the in vivo optical properties of the benthic pennate diatom Pleurosigma strigosum in subtidal sediments: characteristics, origins, and possible biological role* Lou-Hannah Dichant, Anna Isaia, Florie Ogor, Lourenço Ribeiro, Aude Leynaert, Kevin Heggarty & Johann Lavaud
12:00-12:15	*The potential of the diatom guild membership as an indicator of biofilm responses to drought and recovery* Mimoza Dani, Sára Beszteri, Willem Kaijser, Andrea Burfeid Castellanos, Michael Kloster & Bánk Beszteri	*Stochastic and deterministic processes influencing mountain mire diatom communities across spatial scales* Fernanda Gonzalez-Saldias, Angel Rain-Franco, Joan Gomà, Jorge García-Girón & Aaron Pérez-Haase
12:15 - 12:30	*A taxonomical and molecular approach on some new taxa from highly alkaline spring in Türkiye* Cüneyt Nadir Solak, Paul Hamilton, Tuğba Ongun Sevindik, Muharrem Balcı, Turgay Durmuş, Alican B. Semerci, Rabia Sezgin, Özden Fakıoğlu, Neslihan Balkıs, Ferhan Yedidağ, Semiha Şahan, Yiğit Suyun, Soner Atik & Ömer Öztürk	
12:30-12:45	*Dealing with light: comparative photophysiological responses of intertidal and subtidal Pleurosigma strigosum inhabiting sediment of the Bay of Brest* Zoé Guillaume	
13:00 – 15:00	Lunch Break	
15:00 – 16:30	Claustro de derecho - **Poster session***	
17:00 – 18:30	Paraninfo - Closing Ceremony	
20:00	Real Casino de Murcia - Gala Dinner	

*Poster Session

Role of diatoms in food and biogeochemical cycles

P55 *"Isolation and characterization of cultivable epiphytic diatoms from commercial Atlantic nori Porphyra umbilicalis and P. dioica"* **Natalia Rodrigues, Helena David, Guilherme Chaves, M. Luísa Dâmaso Rodrigues, Madalena Caria Mendes, André C. Perreira, Inês Oliveira, Margarida Martins, Rodrigo Costa, Lourenço Ribeiro, Tina Keller-Costa & Ana Amorim**

P56 *"A sugary perspective at diatoms"* **Leonard Rößler & Jan-Hendrik Hehemann**

P57 *"Phytotoxic activity of Caulerpa prolifera methanolic extracts on the benthic diatom Fistulifera saprophila from the eutrophic Mar Menor coastal lagoon"* **Yerai Gómez-Leyva, Annamaria Albanese & Marina Aboal**

Epiphytes and symbionts: microhabitats and ecological relationships

P58 *"Diatoms from intermittent rivers across European biogeography"* **Andrea M. Burfeid Castellanos**

P59 *"Influence of Physico-Chemical Factors on Periphytic Diatoms in South Adriatic Marine Lakes"* **Iris Dupčić Radić, Ana Car, Dubravka Hafner & Nika Pasković**

P60 *"Freshwater Diatoms of the Canary Islands: Environmental Drivers of Their Assemblages"* **Paula Mendoza-Casanova, Xavier Benito, Raúl Acosta, Javier Sigró, José María Fernández-Calero, Miguel Cañedo-Argüelles, Núria Cid & Rosa Trobajo**

P61 *"Epiphytic diatoms associated with the invasive alga Ulva australis"* **Natalie Reali, José Maria Monserrat, Dariano Krummenauer & Angela Trocino**

P62 *"Effects of structural improvement measures on diatom communities within the urban area of Braunschweig (Germany)"* **Mahmud Assaf & Anja Schwarz**

P63 *"Experimental Studies of Biotic Interactions Among Diatoms Guilds"* **Phillip Mones, Mimoza Dani, Sára Beszteri & Bánk Beszteri**

Bioindicators in the Water Framework Directive and marine monitoring

P64 *"Freshwater Cocconeis species (Bacillariophyceae) in northern Italy: new findings an implications for quality assessment"* **Francesca Ciutti, Carlos E. Wetzel, Demetrio Mora, Adriano Boscaini, Andrea Chemello, Gabriele Consoli, Filippo Faccenda, Nico Salmaso & Cristina Cappelletti**

P65 *"Diversity of Achnanthidiaceae (Bacillariophyceae) in a mountain lake in Italy"* **Francesca Ciutti, Ulrike Obertegger, Marco Bertoli, Elisabetta Pizzul, Paolo Pastorino, Marino Prearo & Cristina Cappelletti**

P66 *"From soda lakes to hotsprings and freshwaters: Diatom biodiversity patterns in a low impacted area of the Songwe River basin (Southern Tanzania)"* **Joan Gomà, Daniel von Schiller, Azaria Stephano Lameck & Andrea Butturini**

P67 *"Seasonal and spatial Bloom dynamics of diatoms in the western Mediterranean Sea (1994 – 2023)"* **Elena Pérez-Rubín, Nerea Valcárcel-Pérez, Sophia Ouaissa & J.M. Mercado**

P68 *"Ecohydrogeological characterization of spring ecosystems in strategic zones to support long-term monitoring and conservation: The case study of the Emilia-Romagna Region (Italy)"* **Lucia Piana, Soulaima Azizi, Enrico Dinelli, Maria Filippini, Alessandro Gargini, Nicolas Greggio, Andrea Mustoni, Alessandro Petraglia, Laura Pezzolesi, Abdullah Saber, Federico Santi, Daniel Spitale, Marcello Tomaselli, Flavia Tromboni, Mara Simonazzi, Marco Cantonati & Stefano Segadelli**

P69 *"Diatom communities in mountain rivers hosting aquaculture activities: a case study from Trentino (Northern Italy)"* **Cristina Cappelletti, Andrea Chemello, Adriano Boscaini, Gabriele Consoli, Filippo Faccenda, Nico Salmaso & Francesca Ciutti**

Soil diatoms and their use in bioindication

P70 *"Assessing the interplay between habitat tolerance and competitive performance on mountain mire diatoms"* **Fernanda Gonzalez-Saldias, Angel Rain-Franco, Aaron Pérez-Haase & Joan Gomà**

P71 *"Observations on formation of internal valves in edaphic nitzschioid diatoms from abandoned mining soils in Murcia, Spain"* **Teresa Coronado-Parra, Ylenia López-Molina & Marina Aboal**

Diatoms in extreme environments and neglected habitats

P72 *"Diatoms of the hypersaline environment of Pag Saltern, Croatia"* **Lina Kovačević, Manuela Spevec, Dunja Jurina, Sunčica Bosak, Antonija Kulaš, Antonija Matek, Petar Žutinić, Zlatko Levkov, Zrinka Ljubešić, & Marija Gligora Udovič**

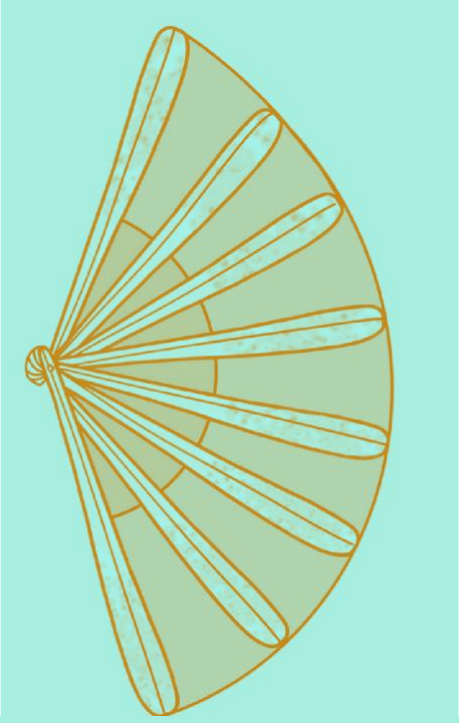
P73 *"Diatom diversity along the Quebrada–Bofedal–Salar continuum of Andean Salares (Chile): Environmental gradients and Conservation Implications under Lithium mining pressure"* **Joan Gomà, Catalina Vasquez, Fernanda Gonzalez-Saldías, Angel Rain-Franco, Javiera Avila, Brayan Bravo, Jose Miguel Bogdanovich & Luis Figueroa-Fabrega**

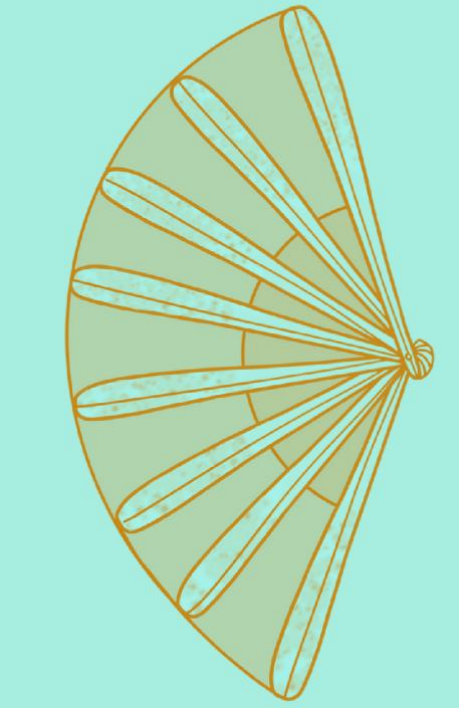
P74 *"Experimental evidence of the driving role of physical constraints in regulating diatom seasonal development in high altitude Alpine streams"* **Mónica Tolotti, Giulia Bertolotti, Stefano Brighenti, Leonardo Cerasino, Matteo Delpero, M. & Maria Vittoria Tenci**

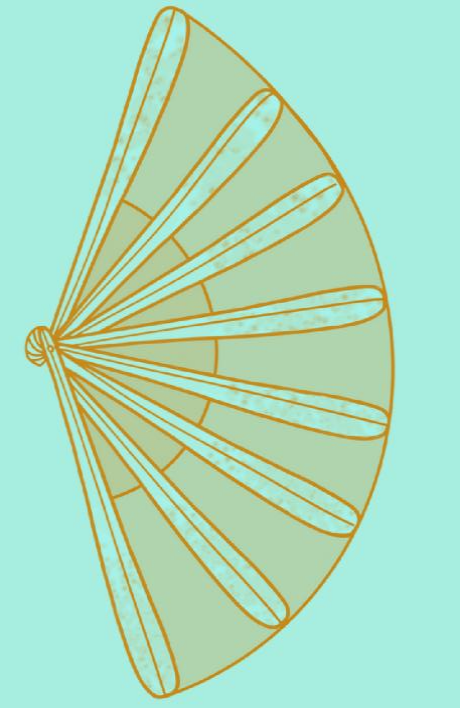
P75 *"Diversity of epilithic diatoms in Alpine headwaters"* **Tenci Maria Vittoria & Tolotti Monica**

P76 *"Diatom Diversity in the Hypersaline Kuyalnyk Estuary (North-Western Black Sea Coast, Ukraine)"* **Viktoriia Berezovska**

July 10th		
Time	Event	Venue
08:30 – 15:00	Field Trips Meeting Point Campus	Mar Menor Semiarid streams







PLENARY SESSIONS

THE LIFE OF MARINE BENTHIC DIATOMS IN INTERTIDAL SEDIMENTS

Graham J. C. Underwood

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Intertidal sediments are extensive habitats across all the world's coastlines. With varying periods of tidal cover, daily and seasonal changes in temperature, salinity and light, and physical disturbance by waves and currents, intertidal sediments provide an stressful combination of environmental challenges for organisms that live in those habitats. However, benthic diatoms can thrive in these environments, with their primary production reaching high levels, and supporting coastal food webs, and carbon and nutrient cycling. This presentation will review some intertidal sediment habitats and the species of diatoms found there, and review their adaptations to these habitats; for example biofilm formation, niche separation, rhythms in photosynthesis, and responses to environmental stressors and interactions with other microbial groups. These insights come from a mixture of field-based ecological measurements and experiments with species under culture conditions. This combination of approaches can help to explain why we find particular diatoms in particular locations and habitats. A key behavioural feature of many benthic diatoms is motility, with vertical migration rhythms driven by a range of environmental cues and signals including light conditions. Work with cell cultures has demonstrated a complex set of potential intercellular signalling moderating phototactic behaviour in benthic diatoms. In summary, the presentation will show how, with their beautiful diversity of form, function and behaviour, benthic intertidal diatoms are an exciting group of ecologically important taxa to study.

GENOMIC IN SIGHTS INTO THE SPECIATION AND ADAPTATION OF DIATOMS

Eveline Pinseel

University Ghent, Belgium.

https://evelinepinseel.weebly.com/

The ecological significance of diatoms, the most biodiverse algal lineage on Earth, cannot easily be overstated. Primary production by diatoms is tightly integrated with aquatic food webs, energy fluxes, biogeochemical cycles, and, ultimately, Earth's climate. Despite their ecological importance, the evolutionary underpinnings of the remarkable diversification of diatoms, as well as of their adaptation to changes in their environment, are still little understood. Here, I aim to give an overview on how recent advances in diatom genomics, from whole-genome sequencing to transcriptomics and population genomics, finally enable us to unravel how diatom lineages originate, diverge, and adapt to heterogenous environments. Ultimately, the integration of different data sources, from taxonomy and experimental work to genomics and environmental DNA, has the potential to reshape our understanding of diatom evolution.

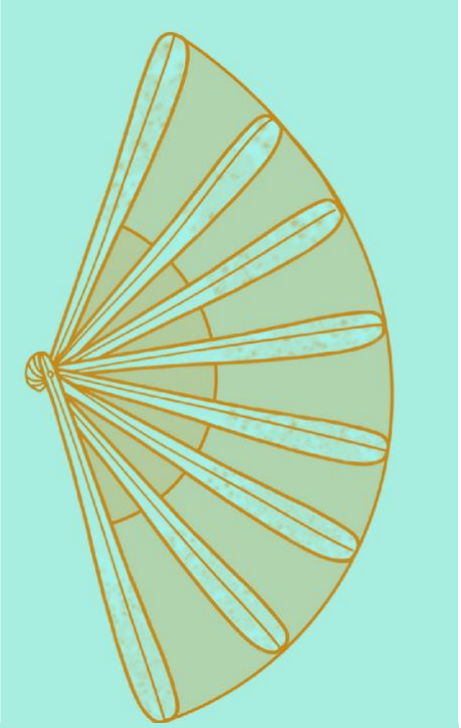
UNRAVELING DIATOM COMMUNITIES IN TEMPORARY RIVERS: TAXONOMIC AND FUNCTIONAL PERSPECTIVES

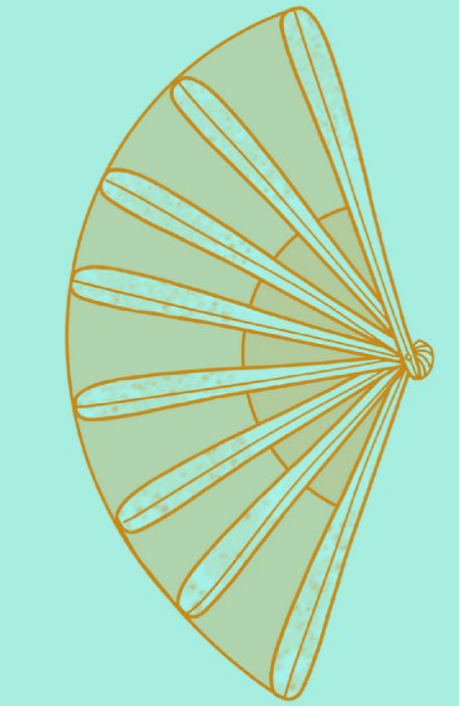
Maria Helena Novais

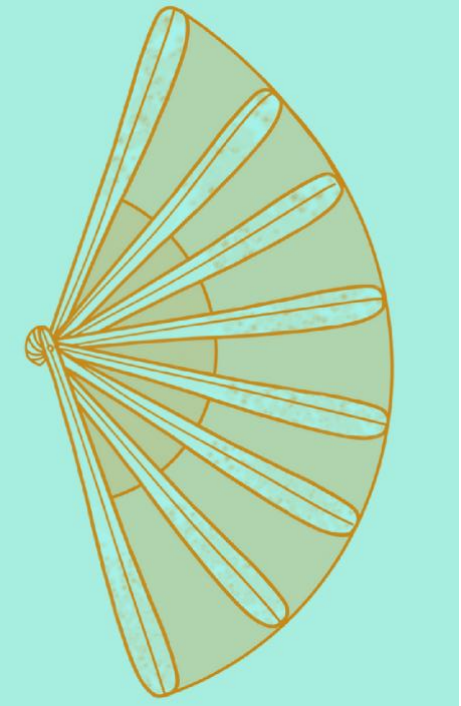
Laboratório da Água da Universidade de Évora - SOL4R - Applied Research in Solar Energy for the Energy Transition, Portugal

hnovais@uevora.pt

Temporary rivers and streams, characterized by periods of flow cessation and often by the complete loss of surface water, have historically been overlooked despite their important contribution to biodiversity, biogeochemical processes, and the functioning of lotic ecosystems. Recent estimates indicate that water ceases to flow for at least one day per year along 51–60% of the global river network, with these systems occurring across all climates, biomes, and continents. Furthermore, many formerly perennial rivers have become intermittent, and the extent of temporary rivers is expected to increase under future global change scenarios. The ecological importance of temporary rivers is increasingly recognized, including their role in supporting freshwater diatoms. As the dominant algal component of biofilms, diatoms contribute significantly to ecosystem functioning, and changes in their diversity, physiology, or biomass can have cascading ecological effects. However, temporary rivers expose diatoms to challenging environmental conditions, including flow reduction, lentification, increased temperatures, atmospheric exposure, desiccation, and enhanced UV radiation. These stressors can affect cell structure, biomass, and community composition, particularly because water is essential for photosynthesis, osmotic regulation, and other metabolic processes. To cope with these conditions, diatoms have developed a range of life-cycle, morphological, and physiological adaptations that enhance their resistance and resilience. These strategies enable them to persist in refuges such as pools, leaf-litter accumulations, and subsurface sediments, and to rapidly recover and recolonize habitats once flow resumes. Such adaptive mechanisms may provide a competitive advantage under the extreme conditions predicted under future climate change scenarios. Diatoms also have the potential to improve biomonitoring programs, including the assessment during the dry phase of temporary rivers, thereby supporting their management and conservation. Despite growing scientific interest, further research is still needed to better understand the taxonomy, diversity, physiology, and ecology of diatoms in these increasingly widespread ecosystems.







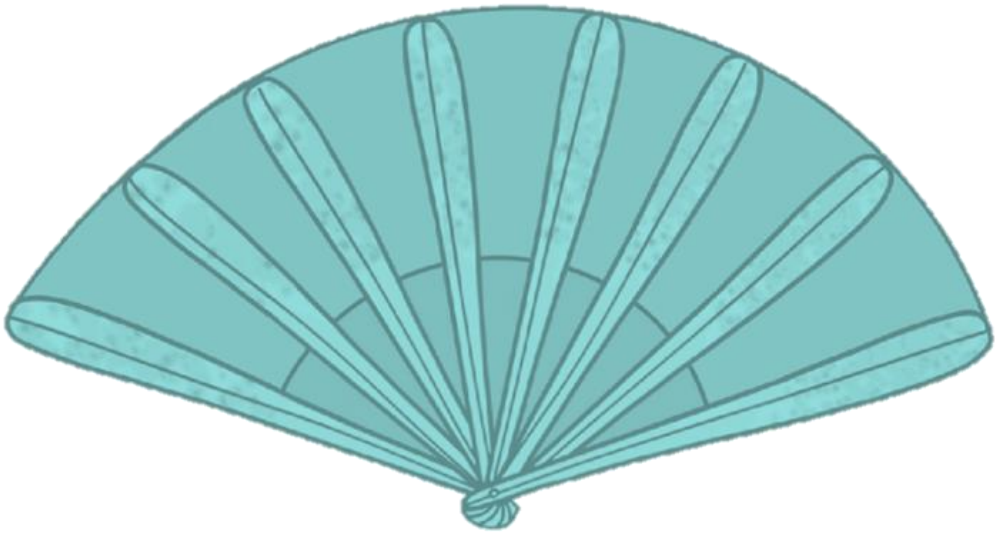
ORAL SESSIONS

July 7th

Session I

Paraninfo – Chairs: Manel Leira & María Cid

Hemiciclo – Chairs: Rafał M. Olszyński & Gillaume Marec



Paraninfo / 9:30 – 9:45

T1.1 Taxonomy / T1.2 Indicators of human impacts: eutrophication, acidification, organic pollutants, metals…

BIODIVERSITY AND LONG-TERM CHANGE IN DIATOM ASSEMBLAGES FROM STREAMS IN THE NEPALESE HIMALAYA

Ingrid Jüttner[1]*, Smriti Gurung[2], Ian Vaughan[3], Steve Ormerod[3], Eileen J. Cox[4], David M. Williams[4], Bart Van de Vijver[5], Carlos E. Wetzel[6] & Dean Jabobsen[7]

[1]Amgueddfa Cymru − Museum Wales, Department of Natural Sciences, Cathays Park, Cardiff, CF10 3NP, UK

[2]Kathmandu University, Department of Environmental Science and Engineering, Dhulikhel, Nepal

[3]Cardiff University, School of Biosciences, Cardiff, Museum Avenue, CF10 3AX

[4]The Natural History Museum, Department of Life Sciences, London, SW7 5BD, UK

[5]Meise Botanic Garden, Research Department, Nieuwelaan 38, 1860 Meise, Belgium & University of Antwerp, Department of Biology – ECOSPHERE, Universiteitsplein 1, 2610 Wilrijk, Belgium

[6]Luxembourg Institute of Science and Technology (LIST), Environmental Research and Innovation Department (ERIN), Observatory for Climate, Environment and Biodiversity (OCEB), 41 rue du Brill, L−4422 Belvaux, Luxembourg

[7]University of Copenhagen, Department of Biology, Freshwater Biology Section, Universitetsparken 4, 2100 Ø Copenhagen, Denmark

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Climate change severely impacts high altitude geographical regions such as the Himalaya affecting freshwaters through changes of stream hydrology and catchment vegetation. We studied diatoms in 13 streams in the Nepalese Himalaya, located between 1465–3907 m, in November 1992, 2000, 2022, and in April 1993, 2023. Using non-metric Multi-Dimensional Scaling and Generalised Linear Latent Variable models we assessed changes in species composition and abundance over time, season, and altitude, and analysed how beta-diversity correlated with altitude.

Most of the species observed regularly are cosmopolitan but some species are currently only known from the Himalaya and several taxa have not yet been identified. Taxon richness and evenness varied little over time or season, but richness tended to be lower > 3500 m. Overall beta-diversity correlated with altitude, driven by a turnover of taxa, while nestedness was insignificant. Differences in assemblage composition were observed between autumn and spring of subsequent years, for each season over time, and across altitude. Seasonal change may be linked to differences in hydrological conditions, temperature and ion composition. Assemblage change across altitude may reflect a combination of factors including a change in catchment vegetation cover, temperature and differences in water chemistry. Some species including *Navicula nielsfogedii*, a species known from Nepal and South East Asia, were more abundant at lower altitudes and increased over time, while *Gomphosinica chubichuensis*, typical at higher altitudes and only occurring above 3200 m, and

dominating a glacier-fed stream at 3907 m during autumn, decreased over time. Although the magnitude in assemblage changes over time varied between streams, most assemblages have changed in both spring and autumn over 30 years, and across the investigated 2442 m altitude range, and may indicate changes in catchment vegetation and hydrological conditions.

Hemiciclo / 9:30 – 9:45

T1.1. Taxonomy

WHAT EXACTLY IS 'INTEGRATIVE TAXONOMY': HEMIAULUS, HEMIBOSCIA AND THE GEOGRAPHY OF EXTINCTION

David M. Williams[1]* & Pat A. Sims[1]

[1]The Natural History Museum, Cromwell Road, London SW7 5BD, UK

*d.m.williams@nhm.ac.uk

Way back in 2005, a malacologist from the California Academy of Sciences published a piece entitled 'Towards Integrative Taxonomy'. He wrote: "'Integrative taxonomy' is defined as the science that aims to delimit the units of life's diversity from multiple and complementary perspectives (phylogeography, comparative morphology, population genetics, ecology, development, behaviour, etc.)'. It seemed, or so it appeared, that it was simply a call for more data – and yet a simple examination of his list suggests that this is not quite the case. As time passed, the idea of 'Integrative Taxonomy' mutated into a variation of a 'molecules and morphology' approach, with molecular taxonomy forming the basis of the classification and the rest (other data, other notions) added as a series of narratives. There is, however, an older more comprehensive version of integration, one that had its basis in comparative biology (systematics/classification) and offers a compelling way of how to do 'Integrative Taxonomy'. This presentation will offer a re-examination of some species in the genus *Hemiaulus*, those species that have since been placed in *Hemiboscia*, a presumed extinct genus of some 5-6 species. This re-examination considers current molecular data, new morphological data, and its interpretation, and biogeographic data, to present a view from the perspective of taxon relationships (systematics/classification).

Paraninfo / 9:45 – 10:00

T1.2 Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

MULTI-SCALE ASSESSMENT OF WATER QUALITY IN A HUMAN-IMPACTED SOUTHWESTERN MEDITERRANEAN WATERSHED USING BENTHIC DIATOM BIOINDICATORS

Soulaima Azizi[1,2*], Sondes Melliti Ben Garali[1], Kaouther Mejri Kousri[1], Mustapha Béjaoui[3], Anne Eulin-Garrigue[4], Abdelhafidh Khazri[3], Marco Cantonati[2*] & Asma Sakka Hlaili[1]

[1]University of Carthage, Faculty of Sciences of Bizerte, Laboratory of Plant Toxicology and Microbiology, LR18ES38; Unit of Plant Biology and Phytoplanktonology, 7021 Bizerte Tunisia;

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Freshwater ecosystems worldwide are increasingly threatened by multiple anthropogenic pressures, highlighting the need for reliable tools to assess ecological status. This study evaluated water quality using diatom-based indices in wadis draining into the Bizerte Lagoon (Northern Tunisia), a Mediterranean transitional system. Sampling was conducted during five seasonal campaigns between winter 2024 and winter 2025. Three wadis were selected according to dominant land-use pressures: proximity to a wastewater treatment plant, agricultural activity, and urban influence. For each stream, upstream and downstream sites were investigated to assess spatial variability. Diatom community showed clear responses to land use and seasonal variation. Sites influenced by wastewater discharge were characterised by high abundances of pollution-tolerant taxa, including *Navicula veneta* and *Gomphonema parvulum*, indicating degraded ecological conditions. Agricultural sites exhibited a higher frequency of *Nitzschia inconspicua*, which is commonly associated with nutrient enrichment,and disturbed freshwater environments. Downstream sites closer to the lagoon, particularly during warmer seasons, displayed increased proportions of halophilous taxa such as *Navicula salinarum* and *Navicula simulata*. The occurrence of typically marine genera, including *Haslea ostrearia* and *Gyrosigma kuetzingii,* confirmed saline intrusion from the lagoon. Overall, diatom indices effectively reflected spatial and seasonal gradients of anthropogenic pressure. The findings confirm the suitability of diatoms as robust bioindicators for ecological assessment in freshwater and transitional ecosystems under increasing environmental stress.

Hemiciclo / 9:45 – 10:00

T1.1. Taxonomy

MULTIGENE PHYLOGENY AND ULTRASTRUCTURE OF ENTOMONEIS: BRIDGING EVOLUTIONARY AND TAXONOMY GAPS USING CULTIVATED STRAINS

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The taxonomic positioning of genus *Entomoneis* Ehrenberg was historically laced with challenges and uncertainties: from establishment of genus *Amphiprora* that represented sort of "dumping-ground" for keeled diatoms of peculiar panduriform shapes, through Patrick and Reimer's re-definition of genus to finally recognizing *Entomoneis* and *Platichthys* as two distinct genera of Entomoneidaceae family. Last decade was exceptionally fruitful in new species descriptions with 14 newly described taxa (total of 9 publications), however, still smaller percentage (22%) of those studies included phylogenetic positioning of specimens. On the other hand, significantly higher number of cultivated *Entomoneis* specimens (of frequently questionable identification) are being published in biotechnological studies often providing phylogenetic reconstruction of rapidly increasing number of available sequences (majorly *rbc*L) – introducing noise to already unresolved genus. Therefore, increasing our efforts in cultivating and properly identifying *Entomoneis* taxa will fill evolutionary and taxonomical gaps of this complex genus. Within this study, we present results from analysing 26 strains belonging to *E. vilicicii*, *E. infula*, *E. sulcata*, *E. vertebralis*, *E. punctulata* and three potentially new taxa. Strains were sequenced for nuclear SSU and plastid *rbc*L and *psb*C genes and were examined in light (LM) and electron microscopy (scanning and transmission – SEM and TEM), providing detailed ultrastructure of frustules. ML and Bayesian phylogenies on single-gene and multigene datasets were reconstructed and tree topologies (monophyletic vs. paraphyletic) of the genus comparing *rbc*L vs. SSU and *psb*C genes were tested. Comparisons with other known taxa are discussed and future remarks highlighting need for comprehensive approach to *Entomoneis* taxonomy are provided.

Paraninfo / 10:00 – 10:15

T1.2. Indicators of human impacts: eutrophication, acidification, organic pollutants, metals…

NATURAL OR ANTHROPOGENIC? WHAT DRIVES DIATOM COMMUNITIES IN AN URBAN TROPICAL MONSOON-DRIVEN RIVER BASIN?

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Understanding whether seasonal hydrology or spatial anthropogenic gradients dominate diatom community assembly is central to biomonitoring in tropical rivers. We investigated benthic diatom communities in the Mula-Mutha River Basin (Western India) across three hydrological seasons (pre-monsoon, monsoon, post-monsoon) over three years (2022–2024), spanning strong upstream-downstream gradients in land use and water chemistry.

Diatom richness and diversity remained relatively stable across seasons and stretches, whereas community composition varied significantly. β-diversity was dominated by species turnover, indicating pronounced spatial heterogeneity along the river continuum. Null model analysis revealed that stochastic processes governed community assembly across seasons, likely driven by monsoon-induced hydrological connectivity and enhanced dispersal. In contrast, a shift toward deterministic assembly was observed in the midstream urban stretch, where elevated nutrient and ionic loads imposed strong environmental filtering. Upstream and downstream regions remained predominantly stochastic, suggesting that hydrological mixing overrides environmental selection outside highly impacted zones. Among environmental variables, electrical conductivity emerged as the primary driver of community structure, followed by dissolved oxygen and sulphate.Variation partitioning indicated that spatially structured environmental gradients explained a significant fraction of community variation, although a large unexplained component highlighted the role of stochastic processes. Overall, our findings demonstrate that diatom metacommunity dynamics in a monsoon-driven tropical river are primarily governed by hydrology-driven stochasticity, with deterministic processes emerging only under strong urban influence. These results highlight the need to integrate ecological assembly processes into biomonitoring frameworks for tropical river systems.

Hemiciclo / 10:00 – 10:15

T1.1. Taxonomy

DIVERSITY AND INTEGRATIVE TAXONOMY OF MARINE BENTHIC DIATOMS FROM TROPICAL SULAWESI, INDONESIA

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Sulawesi is among the largest islands in the Indonesia Archipelago. The biodiversity of its benthic diatoms remains underexplored. This study, done in the course of a PhD thesis, presents a comprehensive record of marine benthic diatom from the Gulf of Tomini. Sampling was conducted at seven sites, with fourteen samples collected from various substrates, including macroalgae, sediments, rocks, seagrass, and mangrove roots. Samples were observed and documented using light microscopy (LM) and deposited in the Szczecin Diatom Collection (SZCZ) (University of Szczecin, Poland).

A total of 339 taxa were identified, indicating high diversity dominated by *Gomphonemopsis littoralis*, *Tabularia fasciculata*, and *Paralia longispina*. The highest species richness was observed in genera such as *Mastogloia*, *Amphora*, *Nitzschia*, *Navicula*, *Diploneis*, and *Caloneis*. Several other taxa could not be identified to the species level, highlighting current taxonomic limitations in tropical regions.

In addition to this general work, an integrative approach combining morphological, molecular and genomic investigations was applied to a selected set of strains, already leading to the description of a new species, *Caloneis paraegena* Arsad, Bąk, Gastineau & Witkowski, which was previously regarded as the cosmopolitan *C. egena* before an in deep investigation revealed them to be different. In the frame of this description, the complete plastid and mitochondrial genomes were obtained, representing the first organellar genomes obtained for the genus *Caloneis*. An identical protocol led to obtain the complete plastid genome of *Plagiogramma minus* var. *nanum*, providing new genomic data for this araphid diatom.

These findings highlight Sulawesi, particularly the Gulf of Tomini, as a potential hotspot of marine benthic diatom diversity and provide a basis for future taxonomic and ecological research. The genomic data derived from these strains will also provide strong basis for metabarcoding-based biomonitoring.

Paraninfo / 10:15 – 10:30

T1.2. Indicators of human impacts: eutrophication, acidification, organic pollutants, metals...

TAXONOMIC STRUCTURE OF PHYTOPLANKTON AND PHYTOBENTHOS, WITH SPECIAL EMPHASIS ON BIOINDICATOR DIATOMS, IN RIVERS OF THE SOUTHERN PANTANAL (MS, BRAZIL)

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Pantanal do Sul is one of the largest and most dynamic wetlands on the planet. It is characterized by hydrological pulses that strongly structure aquatic communities and their biodiversity. This preliminary study analyzes the algal composition in two rivers in Pantanal do Sul. It delves into the taxonomy of diatoms due to their recognized bioindicator value. In river systems, phytobenthos is especially relevant for assessing water type and ecological quality. Samples were collected in 2025 during three campaigns (April, July, and September). Three sampling sites were established on the Paraguay River and one site on the Miranda River, both flowing through the Pantanal plain. Phytoplankton samples were obtained from surface water and subsequently concentrated in the laboratory. For phytobenthos analysis, brushes were taken from submerged substrates and macrophytes. Part of the biological material was first examined under a differential interference contrast optical microscope (DIC). Additional aliquots were chemically oxidized to remove organic matter, and the suspension containing diatom frustules was filtered through 1.0 µm pore-size polycarbonate track-etched membranes, mounted on supports, sputter-coated with Au-Pd, and examined using scanning electron microscopy (SEM). Preliminary results revealed low algal density and a high suspended mineral load, characteristic of fluvial systems with intense transport of siliceous material. Chlorophytes, euglenophytes, and especially diatoms were the most prominent groups within the phytoplankton community. Given that these are lotic waters, the study of phytobenthos, particularly the use of diatoms as bioindicators, is highly relevant for establishing community patterns and developing ecological quality indices.

Hemiciclo / 10:15 – 10:30

T1.1 Taxonomy

THE TIP OF THE ICEBERG: COMBINING PHYLOGENETICS, METAGENOMICS, AND REPRODUCTIVE EXPERIMENTS TO UNRAVEL THE DIVERSITY AND BIOGEOGRAPHY OF THE MARINE DIATOM GENUS CYLINDROTHECA

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The globally common, marine, tychoplanktonic diatom genus *Cylindrotheca* is widely used for investigating diatom ecology and biotechnological potential, from studies on diatom-bacteria interactions to reproductive isolation. Although only a handful of species have been described within this genus, it is becoming increasingly clear that *Cylindrotheca* contains previously unrecognized cryptic diversity. The presence of such unrecognized species-level diversity complicates ecological and reproductive studies and obscures biogeographical patterns, yet its extent remains unclear.

Here, we aim to assess the levels of cryptic diversity and species distributions in *Cylindrotheca*. We assembled a global dataset comprising over 500 strains covering all oceans, with a focus on benthic, coastal environments. For each strain, the plastid marker *rbcL* and the mitochondrial marker *cox1* were sequenced to reconstruct phylogenetic relationships and perform molecular species delimitation. These analyses, in combination with crossing experiments, revealed extensive cryptic diversity within the genus, suggesting the presence of more than 50 distinct species. To further investigate the diversity and species distributions in *Cylindrotheca*, *rbcL* sequences were extracted from Tara Oceans and Tara Polar metagenomes, and added to the phylogeny. This revealed extensive presence of *Cylindrotheca* in open ocean phytoplankton, including additional species-level diversity that was not captured by the strain dataset.

Furthermore, our data indicate that different climate zones are mostly inhabited by different species, and that different climate zones were colonized multiple times by the genus.

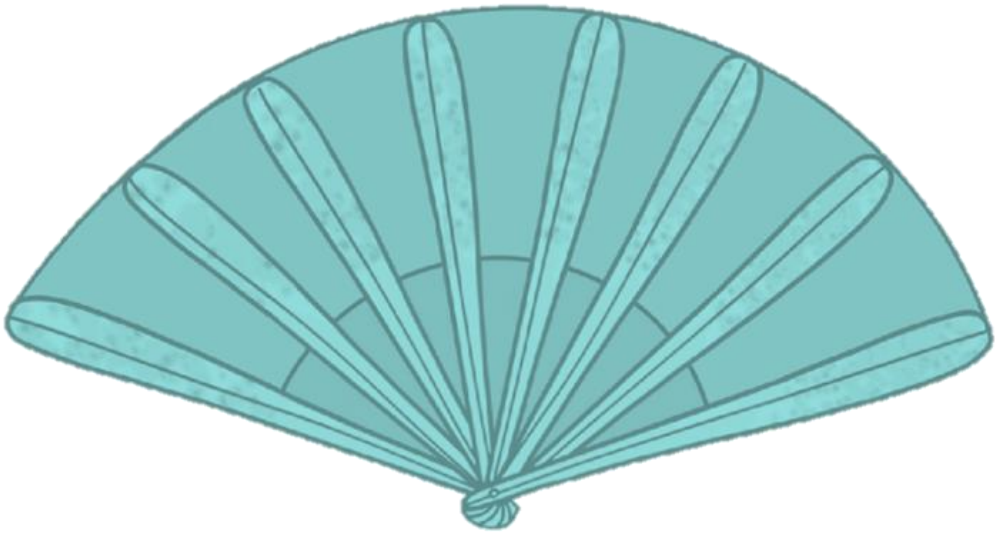
Together, these results highlight an unexpectedly high level of (pseudo)cryptic diversity within a marine diatom genus that was previously considered to be species-poor, and provide new insights into the processes driving diatom diversification and global biogeography.

July 7th

Session II

Paraninfo – Chairs: Ingrid Juttner & Sulaima Azizi

Hemiciclo – Chairs: Maja Muczo & Sulastri Arzad



Paraninfo / 11:00 – 11:15

T1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

ASSESSING EUROPEAN URBAN STREAM ONE HEALTH USING DIATOMS: IMPACTS OF CLIMATE CHANGE AND POTENTIAL REHABILITATION

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World population is concentrated in cities therefore, urban streams are highly impacted. Water quality degradation may lead to enteric diseases but can also promote an increase in disease vectors, such as mosquitoes, thus posing risks to One Health in cities. Diatoms are the dominant primary producers in streams and recognized as good bioindicators of water quality. Therefore, diatom communities from five European cities were studied (Coimbra - Portugal, Benevento - Italy, Toulouse - France, Ghent – Belgium, and Oslo - Norway) covering a climatic gradient and different environmental and social-cultural conditions. A total of 90 streams, covering an urbanization gradient were selected.

Variation in diatom community structure was assessed using redundancy analysis (RDA). The main anthropogenic environmental drivers were nutrients (N+P), and pharmaceuticals (bisoprolol, carbamazepine), while water temperature explained the geographical dispersion of communities according to latitude. Streams in Oslo stood out for the general better water quality compared to the other cities.

Predictive models based on three combined machine learning techniques (HYDRA: Support Vector Machines, Multi-Layer Perceptron, and K-Nearest

Neighbour) were built. These were used to forecast changes in species distribution under three rehabilitation scenarios: (i) nutrient decrease; (ii) combined nutrient and pharmaceutical decrease; (iii) the second scenario coupled with the increase of 1.5°C in water temperature. Comparison between the present and the rehabilitation scenarios highlighted an improvement in the ecological quality of streams. Additionally, there was a predicted expansion of sensitive taxa to streams where they didn't appear and a reduction in the number of sites where some tolerant taxa were previously found.

Therefore, diatom communities can be considered a good indicator of One Health risks, as well as good predictors of restoration measures.

Hemiciclo / 11:00 – 11:15

T1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

ELUCIDATING THE MOLECULAR MECHANISMS UNDERLYING THERMAL NICHE DIFFERENTIATION IN THE CYLINDROTHECA CLOSTERIUM COMPLEX

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Cylindrotheca closterium is a pennate diatom occurring worldwide in marine benthic and pelagic environments, from poles to tropics. Recent studies show *C. closterium* represents a cryptic species complex with significant thermal niche differentiation, with clades showing distinct optimal growth temperatures and thermal niche widths, indicating adaptation to different temperature regimes. Yet the molecular mechanisms by which thermal resistance has evolved across this species complex, and how individual clades respond and acclimate to temperature shifts, remain largely unknown.

We investigated the molecular mechanisms underlying stress responses, acclimation, and adaptation to temperature change in the *C. closterium* complex using comparative genomics and time-resolved transcriptomics/proteomics. First, comparative genome analyses of ten globally distributed strains enabled investigation of genome evolution and (re)organization across polar, temperate, and tropical regions. Whole-genome sequencing resulted in near-complete, chromosome-level assemblies, allowing in-depth investigation of expanded gene families, pan-genomes, and synteny. Second, building on genomic analyses, two warm-adapted and one cold-adapted strain were selected to study their short-term stress (1 h, 24 h) and longer-term acclimation (1 week) responses to temperature shifts (±8°C from baseline) using transcriptomics and proteomics.

Responses were largely strain-specific at the ortholog level, with warm- and cold-adapted strains showing distinct reactions to heat stress, though a conserved functional response was also identified. The 1 h response reflected initial stress (heat shock proteins), followed by acclimation at 24 h and 1 week timepoints. Key mechanisms in warm acclimation involved modulation of chloroplast

function, photosynthesis, and lipid metabolism, whereas ribosome-associated processes and RNA processing played a primary role in cold acclimation.

These results advance our understanding of molecular mechanisms underlying thermal responses in a globally distributed, ecologically relevant diatom with implications for predicting general marine microbial responses to ocean warming.

Paraninfo / 11:15 – 11:30

T1.2. Indicators of human impacts: eutrophication, acidification, organic pollutants, metals…

ENHANCED WATER-LEVEL FLUCTUATIONS DUE TO ARTIFICIAL SNOW PRODUCTION REDUCE DIATOM DIVERSITY AND THREATENED RED LIST SPECIES IN A HIGH-MOUNTAIN LAKE OF THE SOUTH-EASTERN ALPS

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Due to increasing pressure to exploit water resources in high-mountain lakes under climate change, a more detailed understanding of ecological impacts on biodiversity is needed. We studied a high-mountain lake (Monticello) in the south-eastern Alps affected by enhanced water-level fluctuations (WLFs) caused by water diversion for artificial snow production over five years (2017–2021), and compared it with three similar lakes in the nearby Adamello-Brenta Nature Park. In addition, we included a high-altitude, low-conductivity lake from the same region with established long-term ecological data (including benthic diatoms), where epilithic diatom depth distribution has also been investigated. We focused on epilithic diatoms and physical o and chemical parameters, although data on macroinvertebrates are also available. Our results clearly show lower diatom diversity and a reduced number of Red List species in threatened categories in the lake used for artificial snow production. Notably, *Denticula tenuis* was confirmed as a reliable indicator species of pronounced WLFs, also in low-conductivity lakes. Using the IndVal procedure, we identified statistically significant diatom indicator species associated with the following conditions: (i) lakes affected by exploitation-induced WLFs and alkalinization; (ii) lakes with stable water levels and naturally low alkalinity; (iii) lakes with naturally fluctuating levels and low alkalinity; (iv) lakes with exploitation-induced WLFs and naturally low alkalinity; and (v) lakes with relatively stable levels and natural alkalinization. These results highlight the sensitivity of high-mountain lakes in the south-eastern Alps to anthropogenic water management.

Hemiciclo / 11:15 – 11:30

T1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

POLYPHASIC CHARACTERIZATION OF PLANOTHIDIUM STRAINS WITHOUT A SINUS OR CAVUM ISOLATED FROM STREAMS IN CALIFORNIA, USA

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The ubiquitous and diverse genus *Planothidium* plays a central role in freshwater bioassessment worldwide. In California, earlier morphology-based studies (Stancheva et al. 2020) identified four *Planothidium* species with a sinus, nine with a cavum, and seven with uninterrupted striae. In this study, 41 monoclonal *Planothidium* strains isolated from streams in California in 2021, along with 67 reference sequences from GenBank, were analyzed to construct a concatenated phylogenetic tree and to evaluate their phylogenetic placement within the genus *Planothidium* based on 18SV4 and *rbc*L genes. Seven Californian strains, which lack either a sinus or a cavum and are morphologically similar to *Planothidium engelbrechtii* and *P. pericavum*, clustered together with species that also share an absence of those features. Analysis of the concatenated genetic distances (18SV4 and *rbc*L) indicated no divergence among six of these strains, which originate from the same river, while one strain (D334_009), isolated from a non-perennial stream, differed by 1.9%. This level of divergence falls below that observed among other taxa within the clade, which differed by 3.5–5.1%, leaving the taxonomic significance of that strain unclear. Consequently, additional evaluation of morphological and ultrastructural characteristics is needed before drawing conclusions about species boundaries. We discuss the morphological, ultrastructural, and ecological features relevant to species identification within this group, as well as the implications of these taxonomic considerations for environmental applications. These results highlight the need for integrative approaches combining molecular, morphological, and ecological data to resolve species boundaries within *Planothidium* and improve their application in environmental assessments.

A recent proposal to split *Planothidium* into different genera is discussed with respect to nomenclatural stability and impacts for applied research.

Paraninfo / 11:30 – 11:45

T1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

INTEGRATING PHYSICOCHEMICAL PARAMETERS AND BENTHIC DIATOMS TO ASSESS WATER QUALITY IN DEGRADED MEDITERRANEAN SURFACE WATERS

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Increasing human pressures on surface waters highlight the need for integrated assessments of their quality and ecological integrity combining environmental parameters and biological tools. Benthic diatoms are widely used as reliable bioindicators due to their rapid and sensitive response to environmental changes and pollution. The study evaluated water quality in Jedara and Guennine wadis (southwestern Mediterranean region) through the analysis of physicochemical parameters and benthic diatom assemblages. Both wadis were under heavy anthropogenic impacts due to their proximity to industrial areas and wastewater plants. The wadis exhibited elevated nutrient concentrations (TN: 16 - 27 mg L^{-1}; TP: 7 – 10 mg L^{-1}) and Chl *a* (15 - 51 µg L^{-1}), along with low dissolved oxygen (2.2 – 2.4 mg L^{-1}) and high BOD_5 (10 - 12) and CDO (94 – 131 mg O_2 L^{-1}) levels. Sediment analyses also revealed the presence of several metals, particularly Pb (35 – 180 mg kg^{-1} dry weight) and As (10 – 34 mg kg^{-1} dry weight). These degraded conditions are reflected in benthic diatom assemblages dominated by pollution- and nutrient-tolerant taxa. In Jedara wadi, *Nitzschia umbonata* was dominant (35% of the total assemblage), indicating high trophic and pollution states. In Guennine wadi, the diatom assemblage revealed environmental stress through the co-occurrence of nutrient-tolerant taxa (*Navicula veneta* and *Amphora veneta*) and brackish-water species (*Nitzschia salinarum* and *Nitzschia thermalis*), indicating elevated trophic and salinity levels. The presence of *Craticula subminuscula* further signaled hydrological stress, associated with low-flow conditions and intermittent drying.

Hemiciclo / 11:30 – 11:45

T1.1 Taxonomy

TAXONOMIC STUDY ON TWO NEW LUTICOLA SPECIES INHABITING KOREAN TIDAL FLATS

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In this study, two novel diatom species of the genus *Luticola* are described, which were isolated from the gut contents of the terrestrial gastropod *Ellobium chinense* inhabiting a supratidal salt marsh on the west coast of Korea. The taxonomic identity of these species was established through precise morphological examinations using light (LM) and scanning electron microscopy (SEM). These new taxa were compared with morphologically allied species, including *L. cribiareolata* and *L. orientalis*, based on key diagnostic features such as valve size, striae configuration, and central area ultrastructure. In addition to the taxonomic descriptions, we discussed the broader distributional patterns and biogeographical significance of marine and brackish *Luticola* species within East Asia. This research enhances our understanding of the species diversity and the unique ecological niches occupied by the genus *Luticola* in coastal ecosystems.

Paraninfo / 11:45 – 12:00

T1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental change

CONTRASTING EFFECTS OF TORRENTIALITY AND FLOW REGULATION ON DIATOM METACOMMUNITY DYNAMICS IN MEDITERRANEAN RIVERS

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Mediterranean rivers are characterized by natural flow intermittency (torrentiality) and increasingly impacted by anthropogenic flow regulation, yet how these contrasting drivers shape metacommunity structure remains poorly understood. We examined diatom assemblages across four Mediterranean rivers spanning gradients of torrentiality (9.1–27.2) and flow regulation (Total Impoundment Ratio: 0.25–2.11) over two years (2010–2011; 19 sites, 236 species). Contrary to predictions, torrentiality reduced rather than increased local beta diversity ($r = -0.58$, $p < 0.01$), suggesting dispersal-mediated homogenization during favorable hydrological conditions. However, torrential rivers exhibited the largest increases in gamma diversity (>27 species, >33%), indicating that torrentiality promotes regional species pools through facilitated colonization. Flow regulation increased temporal turnover (>20% in highly regulated rivers) but did not reduce local diversity, instead destabilizing metacommunity processes: structuring mechanisms shifted between years in regulated rivers (chaotic to structured) while remaining consistent in natural systems. Mantel tests revealed contrasting metacommunity dynamics. Torrential rivers were structured by dispersal processes (mass effects: $r = 0.82$, $p < 0.05$), while natural rivers exhibited hybrid dynamics combining environmental filtering and dispersal limitation. Variation partitioning showed that environmental and spatial effects were largely confounded (Environment × Space = 8–9%), precluding simple species sT1. Dynamics and diversity of diatom communities in time and space. Diatoms as sentinels of past and present environmental changeorting versus mass effects dichotomies. The substantial increase in diversity in 2011 (>9 species, >24%) and temporal shift from environment-dominated to dispersal-influenced structuring suggests strong climate-mediated effects on metacommunity dynamics. Our findings challenge the assumption that natural flow variability increases local heterogeneity and reveal that flow regulation acts primarily as a temporal destabilizer rather than an environmental filter, with implications for river restoration and management under climate change.

Hemiciclo / 11:45 – 12:00

T1.1 Taxonomy

HALAMPHORA DIVERSITY IN TURKISH COASTS

Cüneyt Nadir Solak[1]*, Paul Hamilton[1], Kalina Monoylov[1], Tolga Çetin[1], Alper Uğurluoğlu[1], Elif Yılmaz[1], Nesil Ertorun[1], Buse Özalp[1], Yelda Aktan[1], Haşim Sömek[1], Tuğba Ongun Sevindik[1], Neslihan özdelice[1], Turgay Durmuş[1] & Seher Dirican[1]

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Türkiye occupies a unique geographical position, being bordered by four distinct marine basins: the Black Sea, the Aegean Sea, the Mediterranean Sea, and the Sea of Marmara. In this study, 193 diatom species were found belonging to the genus *Halamphora* from 24 coastal stations across these basins. Sixteen described taxa were consistently found throughout the four seas. Among them, *Halamphora hyalina* and *H. kolbei* exist in all seas. *Halamphora angularis, H. cejudoae* and *H. montana* were found in Aegean Sea while, *Halamphora angustiformis, H. isumiensis, H. veneta* were in Mediterranean Sea and from the Black Sea *Halamphora hamiltoniana, H. luciae,* and *H. pseudohyalina*. The high number of unique *Halamphora* species found in these different seas, highlights unique marine ecozones with rich biodiversity.

Paraninfo / 12:00 – 12:15

T1.3. Paleolimnological and paleoclimatic reconstructions

ENVIRONMENTAL HISTORY OF LAKE MOO (NORTHERN APENNINES, ITALY) AND OF ITS CATCHMENT SINCE THE LAST PHASE OF THE LITTLE ICE AGE AS RECONSTRUCTED FROM DIATOM ANALYSIS OF LAKE SEDIMENTS

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Small mountain lacustrine basins (<1 km²) constitute high-resolution geological archives capable of recording subtle climatic and tectonic signals over historical timescales. This study investigates the sedimentary record of Lake Moo (1130 m a.s.l.), a flood-prone alpine basin selected for its vulnerability to hydrological disturbances during both the Holocene and recent flood events, including the extreme event of September 2015. Floods generated by tributary streams have significantly affected the central plain area and lake basin, highlighting the site's geomorphological vulnerability. The area is protected within the Natura 2000 network and classified as a geological site of regional importance. The main objective was to use diatoms as hydrological tracers to identify the source habitats of characteristic species in lake sediments. In 2024, a 145-cm sediment core was retrieved and subsampled at 1-cm resolution. Diatoms were also sampled from the two main inflowing streams and from lake microhabitats, including aquatic macrophytes, nearshore surface sediments and tychoplankton. High-resolution magnetic susceptibility and X-ray fluorescence (XRF) analyses were performed at 10-mm intervals. Core chronology was established using ^210Pb and ^137Cs radiometric dating, indicating an average sedimentation rate of ~0.5 cm yr^{-1}. Based on these constraints, sediment layers down to −105 cm were selected for diatom taphocoenosis analyses encompassing the late phase of the Little Ice Age (ca. 1775–1855). Results show that planktic centric diatoms are absent, indicating that Lake Moo has always been a small shallow basin where only tychoplankton develops. Dominant

diatom species are associated with aquatic vegetation or surface sediments. The predominance of araphid diatoms, particularly *Fragilaria*, *Staurosira*, and *Staurosirella,* reflects cold, shallow, and well-mixed conditions, whereas *Achnanthidium jackii* and *Gomphonema pumilum* var. *rigidum* suggest short intervals of milder conditions. These findings demonstrate the value of diatom assemblages as sensitive tracers of hydrological variability and paleoenvironmental change in small mountain lentic systems.

Hemiciclo / 12:00 – 12:15

T1.2. Indicators of human impacts: eutrophication, acidification, organic pollutants, metals…

A MULTISCALE SPATIAL CHARACTERIZATION REVEALS THE MAIN ENVIRONMENTAL FACTORS SHAPING DIATOM COMMUNITIES IN MARINE BIOFILMS

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Although poorly studied, diatoms are the dominant autotrophs in marine biofilms colonizing both natural and artificial substrates. The aim here was to decipher the relative influence of multiple potential community drivers such as nutrients, physicochemical parameters, trace metals, and major historic organic pollutants on the diversity of diatom communities at large and local spatial scales along the 1800 km of the French Northwestern Mediterranean coast.

Biofilms were developed over a period of 3 months on 150 HD polyethylene A4 plates deployed in triplicates at 50 sites exhibiting contrasting contamination profiles along the 1,800 km of the French Mediterranean coast during the 2021 SUCHIMED oceanographic campaign. Physicochemical parameters and nutrients come from the Copernicus and MENOR databases while 72 contaminants including polycyclic aromatic hydrocarbons, polychlorinated biphenyls, organochlorine pesticides and trace metal elements were quantified in biofilms. Diatom diversity was determined using DNA metabarcoding targeting the *rbcL* gene while EPS (proteins, carbohydrates, and uronic acids) were analyzed through biochemical assays.

Highly diversified diatom assemblages characterized plastispheres, with clear distinct communities clustering along three ecoregions: sites located at the west of the Rhone River, at the east of the Rhone River and in Corsica. Distance-based redundancy analyses and variance partitioning demonstrated that community differentiation at the ecoregion scales were mainly influenced by gradients of temperature, salinity and nutrients, with limited influence of pollutants profiles and concentrations. However, the influence of trace metals and organic pollutants on the diatom community structures significantly increased at smaller spatial scales, i.e. metropolitan-scale area, even surpassing physicochemical parameters and nutrients.

Paraninfo / 12:15 – 12:30

T1.1 Taxonomy

SMALL ISLAND, GLOBAL CONNECTIONS: REMARKABLE DIATOM FINDINGS FROM AN ISOLATED ISLAND IN THE NORTHWEST PACIFIC

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Ulleung Island is a volcanic island located off the east coast of Korea in the Northwest Pacific. Due to its geographic isolation and steep bathymetry, its benthic diatom flora represents a significant area of biogeographical interest. This study reports on remarkable diatom findings recovered from subtidal sediments of Ulleung Island, challenging conventional understandings of diatom distribution and regional endemism.

Morphological analysis using light and scanning electron microscopy (SEM) revealed several taxa with highly disjunct distribution patterns. Most notably, we recorded the biraphid diatom *Hippodonta kaiseri*, a species previously documented only from the lower Mississippi River, USA. Additionally, our findings include a *Tryblioptichus* taxon exhibiting close morphological affinities to *T. hainanensis* from Hainan Island, China, though further comparative study is warranted to clarify its taxonomic identity. Furthermore, we observed a distinct araphid morphotype showing striking similarities to fossil specimens from Japan; while currently assigned to the genus *Rhaponeis*, its precise taxonomic placement requires further evaluation despite sufficient specimens being recorded.

The presence of these far-flung lineages in recent sediments of a remote volcanic island raises questions regarding long-distance dispersal or the potential for Ulleung Island to act as an evolutionary refugium. While the living status of these valves remains to be confirmed, their presence in surface sediments suggests relatively recent or ongoing occurrence. This study highlights the importance of exploring isolated habitats to uncover hidden global connections and refine diatom biogeography.

Hemiciclo / 12:15 – 12:30

T1.1. Taxonomy

HIDDEN DIVERSITY OF NITZSCHIA IN THE BOGDAŁÓW POST-MINING RESERVOIR REVEALED BY INTEGRATIVE TAXONOMY

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Bogdałów, a post-mining reservoir in Poland formed by flooding a former lignite open-pit, represents an anthropogenic ecosystem that supports diverse diatom assemblages. This study examines the species diversity of the genus *Nitzschia* in this poorly investigated habitat, focusing on members of the Lanceolatae group, including *Nitzschia palea, N. gracilis, N. radicula*, and two species described from this reservoir, *N. nandorii* and *N. excavata*, as well as the Lineares group, represented by *N. linearis, N. subtilis*, and *N. tenuis*. To evaluate morphological and molecular differences among the studied *Nitzschia* taxa, we applied an integrative taxonomic approach combining light and scanning electron microscopy with analyses of nuclear and plastid markers. In *N. nandorii* and *N. excavata*, morphological features provided dependable diagnostic characters that enabled their distinction from similar taxa within their respective groups. Although they are classified within the Lanceolatae, these lineages differ not only in overall valve morphology but also in the structure of pores on the raphe canal wall, which appears to be characteristic of each lineage. This pattern aligns with molecular evidence supporting their separate phylogenetic positions. Our findings indicate that artificial water bodies formed after lignite excavation should not be regarded merely as degraded ecosystems, as reclamation processes can foster the development of habitats supporting high diatom diversity. The Bogdałów reservoir thus represents a valuable model system for investigating diversification within *Nitzschia* and demonstrates the extent of taxonomic diversity that may still remain undetected in post-mining landscapes. The discovery of two new species in a single reservoir highlights that such ecosystems remain insufficiently surveyed and warrant greater focus on biodiversity and taxonomic research. At the same time, our results emphasise the importance of an integrative taxonomic approach, especially in groups with overlapping or cryptic lineages, where morphological differences are reflected in patterns of genetic variation.

Hemiciclo / 12:30 – 12:45

T1.1 Taxonomy

WHAT CONSTITUTES A STIGMA? A REVIEW OF ISOLATED PORE STRUCTURES IN RAPHID DIATOMS

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Since its original designation in 1894 by Cleve for "the peculiar punctum or pore" in some *Cymbella* species, the term 'stigma' has been used to refer to any isolated pore near the central area, although the ultrastructure of such pores varies. The widespread use of the term stigma for all such pores not only hides the structural diversity but also obscures the phylogenetic distribution of the different types. Scanning electron microscopy has revealed variation in the ultrastructure of distinctive isolated pores in or near the central area of raphid diatoms, with different types of pores being restricted to phylogenetic groups.

Unoccluded pores are found in genera of the Cymbellales, characterised by an unoccluded internal foramen with a rounded to slit-like external opening. The most complex type is found in *Cymbella* and *Didymosphenia*, whereas in other genera the isolated pore is reduced to a simple pore through the valve wall.

Internally occluded isolated pores can be found in the marine, brackish or terrestrial genera. In *Fistulifera*, *Labellicula* and *Proschkinia*, the isolated pore has an internal domed hymenate occlusion, whereas *Luticola* and *Olifantiella* have an internally collared hymenate occlusion. The published terms fistula and buciniportula apply respectively. *Parlibellus* has an isolated pore that splits into two internally, for which the term cuniculus was coined and can be retained.

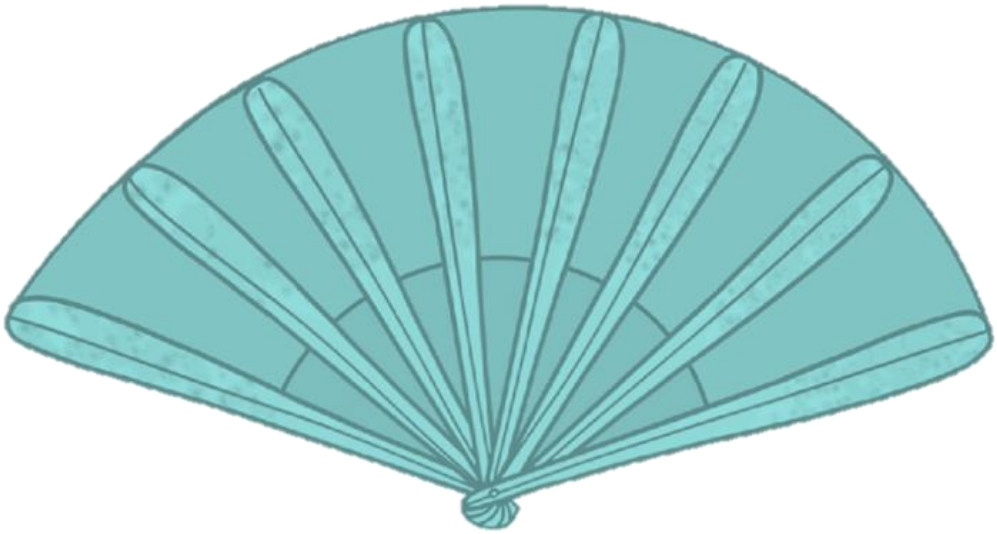
In this lecture, we discuss the different types of isolated pores, particularly refining the discrimination of variants within the Cymbellales, and reveal some interesting ecological patterns. Revised definitions of stigmata and stigmoids are proposed, together with the recognition and definition of another type of stigmoid. The restricted distribution of more precisely defined pore types shows the importance of consistent use of terminology and its relevance to phylogenetic studies.

July 8th

Session I

Paraninfo – Chairs: Éva Ács & Jean-Francois Briand

Hemiciclo – Chairs: Anna Ticha & Nuria Flor



Paraninfo / 9:30 – 9:45

T2.2. Integration of images, AI and machine learning in identification

COUPLING MORPHOLOGY AND METABARCODING REVEALS DIATOM COMMUNITY STRUCTURE ACROSS FLORIDA (USA) COASTAL WATERS

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Phytoplankton monitoring increasingly relies on two high-throughput approaches with complementary strengths: *in situ* imaging, which resolves cell morphology and size for particles >100 µm, and eDNA metabarcoding, which captures broad taxonomic diversity including pico- and nanoplankton but lacks morphological information. Within the Southeast US Marine Biodiversity Observation Network (SEUS MBON), we integrated Continuous Particle Imaging and Classification System (CPICS) observations with 18S rRNA metabarcoding across >300 paired samples from Florida coastal waters (2022–2025). To synoptically evaluate the regional context of in situ measurements we matched these observations with satellite seascapes, a dynamic machine learning classification of pelagic biomes derived from thermal and ocean color data, and model outputs. CPICS images were processed through the EcoTaxa platform (https://ecotaxa.obs-vlfr.fr/) combining morphological feature extraction with supervised machine learning to enable semi-automated annotation at ecosystem scale.

Diatoms dominate the CPICS imagery, led by *Skeletonema*, *Pseudosolenia* and *Chaetoceros*, though many are classified only at morphotype level (e.g., "elongated chains", "centric forms"). Paired 18S metabarcoding resolves these categories into genus- and species-level assemblages: in a representative sample, CPICS "centric" and "chain" categories corresponded at 18S to *Cyclotella, Minutocellus, Skeletonema, Thalassiosira, Chaetoceros* and *Corethron*. Conversely, 18S revealed a picoplankton fraction (Chlorophyta ~27% of eukaryotic reads) entirely invisible to imaging.

Within *Pseudo-nitzschia*, a diatom genus of concern for amnesic shellfish poisoning, 18S resolved 38 ASVs (14 in ≥2 samples), with distinct ASVs showing contrasting affinities across satellite-derived seascape classes. This cryptic intrageneric diversity is undetectable by imaging but has direct implications for

harmful algal bloom risk, given that toxigenic potential varies among *Pseudo-nitzschia* species.

These results establish imaging–metabarcoding integration as a scalable framework for diatom biodiversity and harmful algal bloom monitoring, combining morphological grounding with molecular-scale taxonomic resolution and cryptic-diversity detection in coastal waters.

Hemiciclo / 9:30 – 9:45

T2.2. Integration of images, AI and machine learning in identification

ORGACOUNT: AN ONLINE TOOL FOR PROCESSING DIATOM DATA WITHIN AN INTEGRATED PLATFORM

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Diatom research is nowadays rapidly expanding the volume of data. The continuous flow of updated nomenclature, species revisions, extensive microphotograph databases, and complex biogeographical and ecological indicator values has created a vast wealth of information. While these resources significantly enhance our analytical capabilities, they simultaneously complicate the practical process of species identification, counting, and data processing. Here we present how the digital scientific software OrgaCount, developed within the kladOS platform, part of the mybiOSis ecosystem, can streamline these complex datasets within an integrated system. At this stage, OrgaCount includes a comprehensive taxonomical diatom database, automated biovolume calculation, and tools for generating environmental monitoring statistics. The program is therefore well suited for monitoring in accordance with the Water Framework Directive (WFD), while ensuring harmonized data management and standardization across datasets. Future developments will include building a microphotograph library of species and integrating information on their biogeography and ecology, leveraging the capabilities of the kladOS platform. Having all this data within the integrated platform will then serve as a basis for further AI-based models, particularly for routine diatom monitoring, but also for scientific research.

Paraninfo / 9:45 – 10:00

T2.1. Metabarcoding, metagenomics and molecular biomarkers

METABARCODING REVEALS SPATIO-TEMPORAL VARIATION OF INTRASPECIFIC ASVS AND ECOLOGICAL TYPES IN PSEUDO-NITZSCHIA

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A marine diatom genus *Pseudo-nitzschia* consists of 61 species distributed worldwide. Nearly half of these species are capable of producing domoic acid, which causes amnesic shellfish poisoning (ASP). Although ASP has not been reported in Japan, recent studies suggest increasing occurrence and toxicity under changing environmental conditions. To assess this potential risk, a monthly monitoring survey was conducted from June 2023 to September 2024 at seven sites around Obama Bay, Japan. Because it is difficult to identify species within this genus under light microscopy, metabarcoding analysis targeting the LSU rDNA D1–D3 region was used to track species occurrence. Focusing on amplicon sequence variants (ASVs), we also revealed their spatio-temporal dynamics within species and the occurrence characteristics of ecological types.

A total of 1,335 *Pseudo-nitzschia* ASVs were obtained from 87 samples and assigned to 20 species. Occurrence patterns differed among ASVs within each species. For example, in *P. multiseries*, *P. calliantha*, and *P. linea*, most ASVs appeared only for short periods (2–3 months), whereas in *P. galaxiae*, seasonal patterns were more variable among ASVs. By integrating the number of occurrence sites and months, ASVs were classified into distinct ecological types, including specialists with local/short-term occurrence, generalists with widespread, persistent occurrence, and seasonal event types with widespread/short-term occurrence. In particular, *P. galaxiae* exhibited all three ecological types within a single species and showed both persistent occurrence and bloom-forming dynamics, a pattern that may be unique to Obama Bay. Such intraspecific ecological diversity is increasingly being revealed through metabarcoding, allowing systematic characterization within species.

These results demonstrate that occurrence patterns differ among ASVs even within the same species, revealing seasonal dynamics that cannot be resolved at the species level. Moreover, ASVs with broad spatial distributions do not necessarily persist over time, indicating that spatial extent and temporal persistence vary independently.

Hemiciclo / 9:45 – 10:00

T2.2. Integration of images, AI and machine learning in identification / T2.4. Open data platforms and reproducibility in science

FROM AI MODELS TO REPRODUCIBLE WEB WORKFLOWS: STANDARDIZED MICROSCOPY-BASED ANALYSIS FOR FRESHWATER AND MARINE DIATOMS

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Automated image analysis for diatoms is advancing rapidly, but routine use still depends on whether model outputs can be inspected, checked, exported and reused in taxonomic workflows. Here we present the diatom component of DIAMOND, a web platform developed by the authors to support reproducible analysis of digital microscopy images from freshwater and marine samples. The platform brings together dedicated pipelines for river and ocean diatoms, allowing users to upload micrographs, detect specimens, assign species-level labels, visualize confidence values and export the resulting annotations in standard formats.

The emphasis is not only on identification accuracy, but on traceability. Each analysis can be run with user-defined inference settings and the outputs can be downloaded as JSON, YOLO, Pascal VOC, COCO and spreadsheet reports. This makes the results easier to inspect, curate, compare across samples and incorporate annotation, validation and laboratory record-keeping workflows. In this way, the platform functions as a practical interface between image-based AI and expert diatom analysis, rather than as a closed proof-of-concept model.

The current implementation includes 101 freshwater diatom classes and 40 marine species. Performance was robust in both domains: detection reached mAP50=0.77 for river diatoms and 0.95 for marine diatoms, while classification achieved Top-1 accuracies of 0.96 and 0.97, respectively; Top-3 accuracy reached 0.98 in both datasets. These results indicate that AI-based identification can be embedded in workflows that remain inspectable and reusable by specialists.

Beyond model performance, the main contribution lies in embedding automated identification within a reproducible and transparent web-based workflow with interoperable outputs. In this sense, DIAMOND Digital ecology - Open Demo helps bridge the gap between AI research on diatoms and its scientific and technical use in real-world settings by providing a platform that supports expert review, t dataset curation and more standardized digital microscopy across laboratories.

Paraninfo / 10:00 – 10:15

T2.1. Metabarcoding, metagenomics and molecular biomarkers

THE VILLAINOUS DIATOMS: UNVEILING PSEUDO-NITZSCHIA SPP. IN IRISH WATERS THROUGH MOLECULAR SCREENING AND QUANTIFICATION

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Pseudo-nitzschia is a marine pennate diatom genus that includes species capable of producing domoic acid, a neurotoxin responsible for Amnesic Shellfish Poisoning (ASP). In the Irish waters, (NE Atlantic Ocean), Amnesic Shellfish Toxin (AST) events occur recurrently, posing risks to marine ecosystems and seafood safety. Although advances in monitoring have contributed to an apparent global increase in reported AST events, severe outbreaks and their broader ecosystem impacts underscore the urgent need for rapid, sensitive, and scalable early detection strategies. DNA-based techniques such as quantitative PCR (qPCR) and digital PCR (dPCR) are highly sensitive approaches that have demonstrated strong potential for routine environmental screening. Among the most cutting-edge molecular methodologies, high-throughput microfluidic platforms provide a powerful framework to expand analytical capacity and enable large-scale simultaneous detection. In this study, we evaluated the implementation of high-throughput quantitative PCR (HT-qPCR) using the Standard BioTools BiomarkHD platform for the simultaneous detection of multiple *Pseudo-nitzschia* species, coupled with dPCR for the absolute quantification of selected taxa. A panel of newly developed and validated qPCR assays, including both TaqMan probe-based and EvaGreen dye-based chemistries, targeting rDNA and the domoic acid biosynthetic A (*dab*-A) gene, was successfully transferred and optimized for use on the BiomarkHD platform and QIAcuity dPCR. Assay performance was evaluated using cultured reference strains and subsequently applied to environmental samples collected across multiple locations along the West and South-West coasts of Ireland. Both platforms enabled robust, species-specific detection with high performance and strong resilience to PCR inhibition. This integrated molecular approach provides a powerful framework for large-scale screening of *Pseudo-nitzschia* species distribution, supporting improved assessment of HAB dynamics and associated ASP risk, with strong potential for implementation in routine national monitoring programmes.

Hemiciclo / 10:00 – 10:15

T2.2. Integration of images, AI and machine learning in identification

IMPROVING EUROPEAN BIODIVERSITY RESEARCH – DIATOM DIGITAL IMAGING IN DNAQUAIMG

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The DNAquaIMG project is part of the European biodiversity partnership initiative "biodiversa+", comprising 50 team members from 14 research organisations in 11 countries. It aims to improve transnational biodiversity monitoring in freshwater ecosystems by leveraging synergies with ecological status monitoring activities anchored at water authorities Europe-wide, building on molecular and digital imaging methods. The diatom digital imaging subproject develops and investigates methods building on diatom slide digitization, and interactions of such digitized slides ("virtual slides") with both, experts and computer algorithms, for localizing and identifying diatoms. To remedy the scarcity of training images for the European diatom flora, we are aiming at developing an iterative human-in-the-loop taxonomic annotation workflow in which training data can be expanded alongside computer assisted analyses. To address this overall goal from different angles, we executed three different sub-projects:

1. We tested the application of deep learning models to tell apart diatom species even though they had been trained on genus-level only, i.e., to alleviate the workload for creating training data.
2. We investigated the ability of such deep learning models to generalize, i.e., to identify diatoms on previously unseen data originating from new sampling sites (out-of-sample data), to assess possible approaches for upscaling biogeographical and taxonomical coverage.
3. We implemented a distributed, web-based approach to taxonomic intercalibration with experts across several countries, to support harmonizing taxonomic concepts across geographical regions and national monitoring approaches.

Here we present the current state of our work and discuss first preliminary results.

Paraninfo / 10:15 – 10:30

T2.1. Metabarcoding, metagenomics and molecular biomarkers

ARMCHAIR BIOGEOGRAPHY: THE EMERGING CONTRIBUTIONS OF METABARCODING TO OUR UNDERSTANDING OF MARINE BENTHIC DIATOMS

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High-throughput sequencing has increasingly transformed how we investigate organismal diversity, making it practical to sequence genomes and transcriptomes cheaply and accurately, and to survey the genetic composition and functioning of whole communities through metagenomics, metatranscriptomics and metabarcoding. Early and continuing triumphs of community studies have been provided by the TARA Oceans project, which has included both metagenomics and detailed metabarcoding surveys of plankton using rDNA markers. During the last 10 years, *rbcL*-based metabarcoding has extended into diatom research and a variety of *rbcL* markers, shorter and longer, have been developed for different purposes (studies involving living communities, sedimentary assemblages, forensics, etc). Those markers most often used for Illumina sequencing of living communities (a 331-bp marker or a 263-bp marker that is entirely included within the 331 marker) discriminate most known species and are being used to provide information about species-level diatom community composition and abundance in continental waters, especially rivers and streams, where metabarcoding is proving to be a valuable biomonitoring tool, complementing microscope-based approaches. So far, however, there have been relatively few applications to marine benthos and ECOS project data (see separate presentations by R. Trobajo and A. Kryk), together with the few other datasets publicly available so far, provide a first opportunity to evaluate the insights *rbcL* metabarcoding can give into these habitats. In this presentation we will explore the complications and benefits of metabarcoding benthic marine communities, which contain many more ochrophyte groups than diatoms, and the implications for diatom biodiversity and biogeography of the 93,000 amplicon sequence variants (haplotypes) of the 263-bp marker detected in just five littoral metabarcoding datasets spanning the Mediterranean and NW Atlantic (ECOS), Indonesia (two datasets), and a beach near Edinburgh, Scotland. Almost all without stirring from the armchair.

Hemiciclo / 10:15 – 10:30

T2.4. Open data platforms and reproducibility in science

DIATOM COLLECTIONS: THE PILLARS OF DIATOM RESEARCH

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Diatom collections represent powerful scientific assets when they are treated not just as archives, but as engines for new discovery. This contribution highlights their continued relevance by focusing on different types of questions that only collections can answer properly.

These questions include taxonomic revision grounded in type material, reassessing species distributions through historical records, and linking past observations with contemporary datasets to reveal long-term ecological change.

At the same time, the value of these insights depends on precise identification; even small taxonomic errors and uncertainties can cascade into distorted biogeographic patterns and misleading applied interpretations.

In addition, collections increasingly underpin emerging applications, such as establishing environmental baselines, supporting conservation, and contributing to forensic investigations, extending their relevance well beyond traditional research. However, their full potential is still limited by persistent challenges, including restricted accessibility, uneven digitisation, and the fragmentation of expertise and data across institutions and international networks.

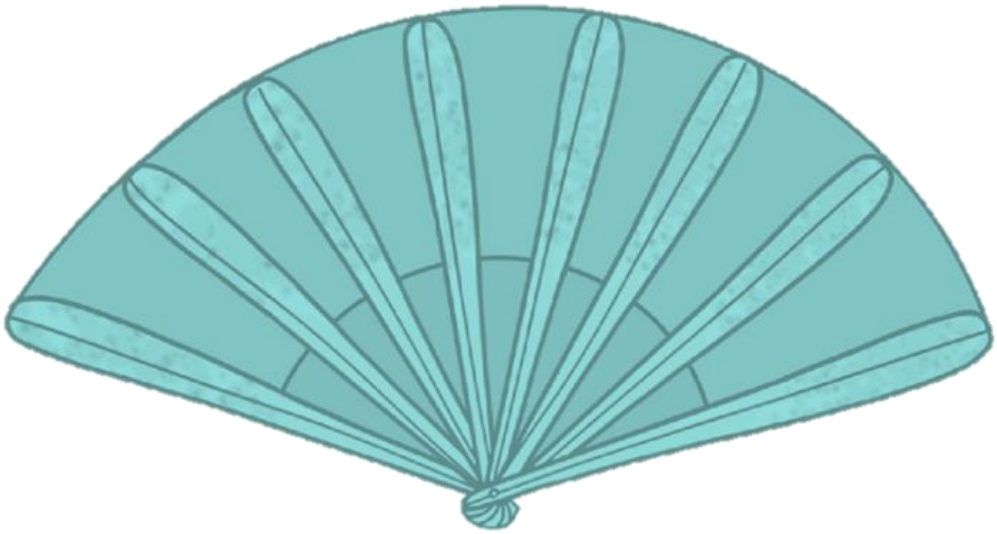
By highlighting these aspects, we aim to stimulate a broader discussion on the role and importance of diatom collections as dynamic and evolving research infrastructures in contemporary science.

July 8th

Session II

Paraninfo – Chairs: Shinya Sato & Antonija Kulas

Hemiciclo – Chairs: Ana Car & Michael Kloster



Paraninfo / 11:00 – 11:15

T2.1. Metabarcoding, metagenomics and molecular biomarkers

ISOLATED WATERS, UNIQUE DIATOMS: METABARCODING INSIGHTS FROM ISLAND STREAMS

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Freshwater streams on islands are naturally isolated ecosystems shaped by dynamic and high variable hydrological regimes. These conditions, combined with strong biogeographic barriers, create opportunities for the emergence of distinctive aquatic communities. However, the processes that shape the benthic diatom assemblages in these habitats remain poorly understood. In this study, we investigated diatom diversity and biogeographic patterns across streams from a global island dataset (La Palma, La Gomera, Tenerife, Mo'orea, Tahiti, Belle-Île-en-Mer, Guadeloupe, Martinique, Malta, Cyprus, Mayotte, Réunion, and New Caledonia) using DNA metabarcoding. The analysis integrates data from multiple sources, such as the CONACAN and DNAqua-Net projects, alongside French national monitoring programs. Metabarcoding has some advantages over traditional light microscopy methods, such as better taxonomic resolution, higher sensitivity for detecting taxa, and the ability to detect cryptic diversity that is often undetected in studies based on diatom morphology. Our findings showed a clear spatial structuring of diatom communities across the islands, with a significant number of amplicon sequence variants (ASVs) detected exclusively on individual islands. Islands such as Tenerife, La Palma, and La Gomera harboured unique ASVs, highlighting the role of island isolation, heterogeneous environmental conditions, and historical factors in shaping diatom biogeography. These preliminary results support the idea that freshwater diatoms on islands may follow similar diversification and endemism patterns to those observed in other freshwater taxonomic groups, despite their considerable theoretical dispersal capacity.

Hemiciclo / 11:00 – 11:15

T2.3. Spectroscopy (Raman, FTIR, etc.) applied to diatom ecology

FLUOROMETRIC APPROACH FOR THE MEASUREMENT OF BENTHIC DIATOMS IN BIOFILMS

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Fluorometric determination of chlorophyll a is a non-destructive method used to estimate microalgal biomass. Exciting phytoplankton with LEDs of different wavelengths enables the differentiation of major algae classes, such as diatoms, green algae, and cyanobacteria, due to their accessory pigments. This method is based on the spectral fingerprints of an algae library.

While this approach is well established for suspended phytoplankton, measuring photosynthetic periphyton is challenging. Benthic microalgae live in thin layers of aufwuchs on sediments and undergo dynamic exchanges due to the effects of their surroundings and motility within the biofilms. The BenthoTorch is a fluorometric device that determines active benthic microalgae in ecological communities on surfaces while taking into account the optical properties of the substrate. The penetration depth is approximately 100 µm. Concentration is expressed as chlorophyll a per cm^2. Fluorometry is a fast method that allows repeated measurements at different sites. This is advantageous when cell lysis occurs during scraping and subsequent extraction. The fluorometric method enables the growth and movement dynamics of diatoms to be studied in situ.

Paraninfo / 11:15 – 11:30

T2.1. Metabarcoding, metagenomics and molecular biomarkers

FROM MICROSCOPE TO METABARCODING: TAXONOMIC GAPS, AND TRANSITION CHALLENGES IN FRESHWATER DIATOM BIOMONITORING IN LUXEMBOURG

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Benthic diatoms (Bacillariophyta) have long served as high-resolution bioindicators of freshwater ecological quality, owing to their rapid physiological responses to pollution and environmental stressors. Under the EU Water Framework Directive (WFD Directive 2000/60/CE), systematic long-term monitoring of diatom communities in Luxembourgish watercourses has been conducted collaboratively by the Administration de la Gestion de l'Eau (AGE) and the Luxembourg Institute of Science and Technology (LIST), generating an extensive historical record spanning nearly three decades. The EQ-CHANGE project builds upon this legacy dataset, consolidating diatom inventories from sites surveyed between 2002 and 2024, supplemented by ongoing digitization of pre-WFD era slides covering the 1994–2000 period. This longitudinal dataset captures the "long tail" of diatom diversity, documenting rare taxa that emerge exclusively under specific environmental conditions, and provides a foundation for preliminary analysis of temporal shifts in community composition, functional guild structures, and pollution tolerance metrics. Despite the robustness of traditional light microscopy (LM) as the quantitative gold standard, its scalability limitations have driven the integration of DNA metabarcoding as a complementary high-throughput approach. However, this transition presents substantial challenges. A critical taxonomic gap persists, with over 68% of Luxembourg's 786 recorded diatom species absent from major genetic reference libraries, rendering a significant proportion of community diversity molecularly invisible. Comparative analysis of LM and molecular methods reveals important divergences in index sensitivity, species detection, and community representation, with only 17.6% of taxa identified concordantly by both approaches. The transition to molecular biomonitoring represents not a straightforward technical substitution, but a fundamental reorganisation of assessment frameworks, one that demands sustained investment in integrative taxonomy, reference library expansion, and the preservation of expert morphological knowledge as an irreplaceable interpretive foundation.

Hemiciclo / 11:15 – 11:30

T2.2 Integration of images, AI and machine learning in identification

IMPLEMENTING THE IMAGING FLOWCYTOBOT IN THE GULF OF NAPLES (MEDITERRANEAN SEA) FOR THE STUDY OF PLANKTONIC DIATOM DIVERSITY AND ECOLOGY

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Diatoms exhibit a high taxonomic, morphological and functional diversity that can be assessed using an integration of methods. In this study, the potential of Imaging FlowCytobot (IFCB), an automated submersible microscope and flow cytometer, is evaluated. Every 20 min, IFCB captures thousands of images of particles in the 10-150 µm size range and calculates over 200 morphometric characteristics for each object. Upon the appropriate training, it can identify taxa and estimate their abundances, documenting rapid changes in diatom community structure. In addition, it is a powerful tool for trait-based analysis, enabling the detection of intraspecific morphological variations over time. The present objectives were the implementation of IFCB in the Gulf of Naples (GoN) and the exploration of diatom trait seasonal variability by testing the first quantitative dataset. For the first objective, a microplankton image dataset was built using IFCB images obtained on 48 sampling dates (1,034 5 ml-subsamples). The dataset included 172,450 manually annotated images, of which 135,756 were diatoms. A Random Forest classifier was developed based on this training set, aiming to automated classification of microplankton communities. After 37 optimisation trials, the resulting classifier, focused on diatoms, identified correctly the majority of its training data, achieving strong performance (F1 score 0.92). Seasonal trends in size, shape, and colonial habit were then explored using 60,919 diatoms images collected on 37 sampling dates, at the Long-Term Ecological Research site MareChiara (164 5 ml-subsamples from Niskin bottles). Preliminary results indicate a significant dominance of colonial forms during winter, early spring, and autumn. Larger and more spherical diatoms were detected in winter and autumn, while longer forms prevailed in spring and linear ones in summer. Overall, this study highlights the IFCB potential for diatom identification and trait-based research, proposing an innovative methodological framework for monitoring diatom diversity and ecology in the Mediterranean Sea.

Paraninfo / 11:30 – 11:45

T.2. Methods, technology and new approaches. Diatoms in the era of big data and integrative biology

DNA METABARCODING REVEALS SEASONAL SHIFTS IN DIATOM GENETIC DIVERSITY FROM COMMUNITIES TO INTRASPECIFIC LEVELS

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Water quality in Mediterranean rivers is subject to marked seasonal variability, mainly due to changes in flow regimes and runoff patterns from the catchment area. Among the biological communities associated with these systems, diatoms are a diverse group of microalgae highly sensitive to environmental changes. Given their ecological importance, understanding processes shaping their distribution patterns is essential. Traditionally, diatom assessment has relied on morphology-based species identification. However, molecular methods have provided a more comprehensive understanding of community structure, allowing the detection of fine-scale genetic variation within species. In this study, DNA metabarcoding was used to assess the effects of seasonality on the diatom communities and their environmental drivers across fifteen streams sampled during the winter and summer in the Aveiro region (Portugal). Our results showed that ASV community composition differed significantly between seasons (PERMANOVA, $p < 0.001$), with summer communities exhibiting higher heterogeneity than winter communities (PERMDISP, $p = 0.009$). These differences were primarily driven by ASV turnover and were associated with contrasting environmental conditions. During the winter, communities were related to nitrogen compounds, particularly nitrate, and water flow, whereas in summer, communities were associated with total phosphorus, water temperature, and biochemical oxygen demand. Moreover, differential abundance analysis revealed season-specific ASVs, with a higher number recorded in winter than in summer. Among the significant ASVs identified, a couple assigned to *Nitzschia palea* showed consistent responses to winter, while others, assigned to *Amphora pediculus*, exhibited different seasonal patterns, suggesting distinctive ecological preferences.

Overall, by using ASV rather than morphology-based species identification, our results reveal that genetic variants within species can provide a more detailed

overview of the ecological preferences, collectively contributing to our understanding of ecosystem dynamics and biodiversity patterns.

Hemiciclo / 11:30 – 11:45

T2.4. Open data platforms and reproducibility in science

DIATOMS MEET DATABASES (SEED): RESOURCES AND PRACTICES TO ENABLE LARGE-SCALE ECOLOGICAL RESEARCH

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The objective of this contribution is to present the results of the first networking grant funded by the International Society for Diatom Research. The aim of the project SeeD was to improve the quality of open-access diatom data to enable large-scale ecological synthesis, with special emphasis on historically under-presented geographical regions such as Latin America. The project focused on mobilizing the diatom community and datasets from Iberoamerica, including freshwaters, marine and transitional waters, and the type of habitats evolved with community interests. The network included 36 diatomists ranging from early-career stages (PhD student, postdoc and established researchers) from 6 different countries. Over two years, the network applied best practices to share datasets with special emphasis on data archiving in Zenodo (https://zenodo.org/communities/seed) through the generation of DOI (Digital Object Identifier) for unpublished datasets. After synthesising data from more than 1,470 sites—including modern, time-series, and palaeolimnological records—we applied a generic, reproducible curation procedure to ensure consistency in diatom taxonomy, environmental variables (e.g. water chemistry, climate), and metadata (e.g. region, analyst, collection, geographical location). We then organised a two-day online workshop to visualise and analyse the first version of the SeeD database. Participants learnt the structure of the relational database (sites, records, samples, taxonomy, diatoms and environment connected tables) and applied R tools to extract records and have them in a usable format for later analyses. The SeeD database is open for new contributions, and its structure allows interrogating ecological questions at local and regional scales supported by reproducible analytical workflows of diatom data analyses. Finally, this presentation aims also at highlighting the non-tangible benefits of the network beyond data synthesis efforts and generating a discussion rooted on the lessons learnt in diatom data stewardship to ensure the continuity of the SeeD project through new scientific collaborations.

Paraninfo / 11:45 – 12:00

T2.1. Metabarcoding, metagenomics and molecular biomarkers

ONE GAMETE, ONE GENOME: GENERATING HOMOZYGOUS CLONES IN AMPHORA COMMUTATA

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Sexual reproduction of the raphid diatom *Amphora commutata* was investigated using clonal strains isolated from brackish water in the Ebro River delta, Spain. During sexual reproduction, gametes are released prior to fusion. We successfully performed micromanipulation under the microscope to isolate individual gametes before syngamy. Of 25 isolated gametes, 4 developed into auxospores and subsequently formed vegetative clones that were morphologically indistinguishable from the vegetative "parental" clones. The "gametic" clones resumed mitotic growth, and their growth rates were comparable to those of the parental clones. Based on Feulgen staining intensity, the gametic clones were inferred to have returned to a diploid nuclear phase, although the timing of nuclear duplication was not directly observed. Notably, these gametic clones were capable of further mating, indicating that they are fully functional within the sexual life cycle.

To evaluate the genomic consequences of this process, we performed whole genome sequencing on six clones, including 2 parental and 4 gametic ones. Heterozygosity was assessed using a k-mer–based approach to estimate ploidy and allele-balance analysis to quantify allelic variation. Compared with the parental diploid clones, gametic clones exhibited markedly reduced heterozygosity, indicating a high degree of homozygosity. These results suggest that gamete-derived clones provide an effective route for generating genetically simplified clones.

The establishment of such highly homozygous clonal lines offers substantial advantages for genomic and functional studies, including improved genome assembly, reduced mapping bias, and more direct interpretation of genotype–phenotype relationships.

Hemiciclo / 11:45 – 12:00

T2.4. Open data platforms and reproducibility in science

DIASPORE: AN OPEN BIBLIOGRAPHIC DATABASE SYNTHESIZING 180+ YEARS OF DIATOM RESEARCH IN SPANISH-SPEAKING COUNTRIES

Seitz Carina[1,2], Leira Manel[3*], Rodríguez-Gómez Carlos F.[4], Castro-Cera Luis[5], Vouilloud Amelia A.[6], Chamorro Susana[7], Blanco Saul[8], Goldenberg-Vilar Alejandra[9], De Gracia Jose[10], Delgado Cristina[11], Sepúlveda-Zúñiga Einer A.[12], Pérez Laura[13], Lopera Congote Laura[14], Romero Liz E.[15], Cuña-Rodríguez Carolina[13], Novelo Eberto[16], Baffico Gustavo[17], Trobajo Rosa[18]

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Diatoms play a central role in aquatic science, with applications spanning environmental monitoring, paleoecology, and biotechnology. Yet, a large body of diatom research produced in Spanish-speaking countries remains difficult to access due to language barriers, fragmented grey literature, and incomplete representation in international databases. In this presentation, we introduce DIASPORE (DIAtom SPanish-speaking cOuntries REgister), an open and collaborative bibliographic database that compiles diatom research from Spanish-speaking countries in Latin America and Spain. The current version of DIASPORE includes 2,699 records spanning 1844–2024, assembled through a systematic effort across 19 countries that integrates institutional repositories, academic databases, published catalogues, and expert contributions.

We highlight key patterns emerging from the database, including the geographic distribution of research efforts, the representation of different environments and study approaches, and the balance between Spanish- and non-Spanish-language publications. These results provide an initial overview of how diatom research has developed across regions and over time, while also revealing important gaps in geographic coverage, research topics, and environments. A central goal of this contribution is to present DIASPORE as a living dataset and a resource for the community. We will demonstrate its associated Shiny web application, which allows users to explore, filter, and download records based on country, author, year, keywords, and environment. We will also outline mechanisms for community contributions, encouraging researchers to help expand, refine, and update the database. DIASPORE is the first interactive compilation of bibliographic research from Spanish-speaking countries, bringing together dispersed gray and non-English literature into a single, open-access platform. We hope it helps to increase the visibility of Spanish-language research, facilitate collaboration, and support future studies on diatom biodiversity, biogeography, and environmental applications.

Paraninfo / 12:00 – 12:15

T2.1. Metabarcoding, metagenomics and molecular biomarkers

FROM INDIVIDUAL CELLS TO NATURAL POPULATIONS: UNCOVERING SEXUAL REPRODUCTION IN CENTRIC DIATOMS USING SINGLE-CELL RNA SEQUENCING AND METATRANSCRIPTOMICS

Nadine Rijsdijk[1,2,3]*, Gust Bilcke[1,2,3], Thomas Eekhout[2,3,4], Michiel Perneel[2,3,5], Rik Debeer[1], Peter Chaerle[1,6], Guillaume Marec[1], Svitlana Lukicheva[2,3], Koen Sabbe[1], Klaas Vandepoele[2,3,7] & Wim Vyverman[1]

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Sexual reproduction is a key event in the life cycle of most diatoms, ensuring genetic recombination and restoring cell size through the formation of an expanding zygote called the auxospore. While the molecular drivers underpinning sexual reproduction have been studied in several pennate diatoms, much less is known about this process in centric diatoms. Apart from the conserved auxospore stage, these two groups differ markedly in their modes of sexual reproduction: whereas pennate diatoms are isogamous, centric diatoms are oogamous and form sperm and egg cells. To date, no genes involved in oogenesis or centric-specific auxosporulation have been identified, and sexual reproduction is rarely observed in natural populations.

We selected *Cyclotella meneghiniana* (*Stephanocyclus planus*) as a model for centric diatom sexual reproduction. This species, isolated from the Scheldt estuary in Belgium, can be sexually induced by increasing the salinity of its medium. We assembled a 341 Mbp reference genome and generated a sexual single-cell RNA sequencing dataset by exposing cells (~15 µm diameter) to increased salinity and harvesting them at multiple time points. This yielded transcriptomes of 9,280 individual cells belonging to 15 distinct cell clusters spanning all stages of sexual differentiation. By leveraging cluster similarities between *C. meneghiniana* and the raphid pennate diatom *Cylindrotheca closterium*, we were able to track expression of previously identified molecular biomarkers for sexual reproduction, as well as reveal novel cell clusters and genes corresponding to centric-specific sexual cell stages, including sperm cells and putative oogonia.

Currently, we are applying these biomarkers in the Scheldt estuary through a six-month metatranscriptome sampling campaign, complemented by metabarcoding, imaging flow cytometry and inverted microscopy. This lab-to-field strategy has the potential to detect sexual reproduction in natural diatom populations and to reveal which species reproduce sexually and when.

Hemiciclo / 12:00 – 12:15

T2.5. Diatoms in forensic sciences

A FORENSIC FRAMEWORK FOR LOSSLESS DIATOM EXTRACTION AND QUANTITATIVE SITE DETERMINATION

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Forensic diatom analysis is a critical tool for drowning diagnosis, yet its reliability depends on high-yield extraction and objective data interpretation. This study presents a comprehensive approach that integrates a novel extraction protocol with a robust statistical framework for drowning-site matching.

The foundational phase utilized the HNO3-PCF method, a lossless light microscopy technique. By employing nitric acid digestion, vacuum filtration, and polycarbonate filter melting, this method ensures maximum diatom recovery without altering community composition, providing the sensitivity required for complex forensic samples.

Building upon this optimized extraction, the study establishes a quantitative framework for forensic drowning-site matching using 32 aquatic–lung pairs. A primary finding of this framework is its high discriminatory power: when evaluating scenarios with limited aquatic candidates, the method achieved a pairing accuracy of up to 95%. Among the metrics tested, Bray–Curtis, Jaccard, and Hellinger distances performed best in identifying the correct site. To further quantify match distinctiveness, Nearest neighbour distance ratio thresholds were derived. Additionally, beta regression identified site spatial tightness — the geographical proximity between drowning and recovery sites—as the sole significant driver of matching accuracy (pseudo-R^2 = 0.50).

The integration of the HNO3-PCF extraction method with distance-based metrics and spatial confidence assessments provides a standardized, statistically quantifiable decision framework. This approach enhances the objectivity of

forensic diatom analysis, transforming it from a qualitative observation into a robust forensic tool.

Paraninfo / 12:15 – 12:30

T2. Methods, technology and new approaches. Diatoms in the era of big data and integrative biology

EVOLUTIONARY SPECIALIZATION AND COLONIZATION WITHIN THE FAMILY STAURONEIDACEAE

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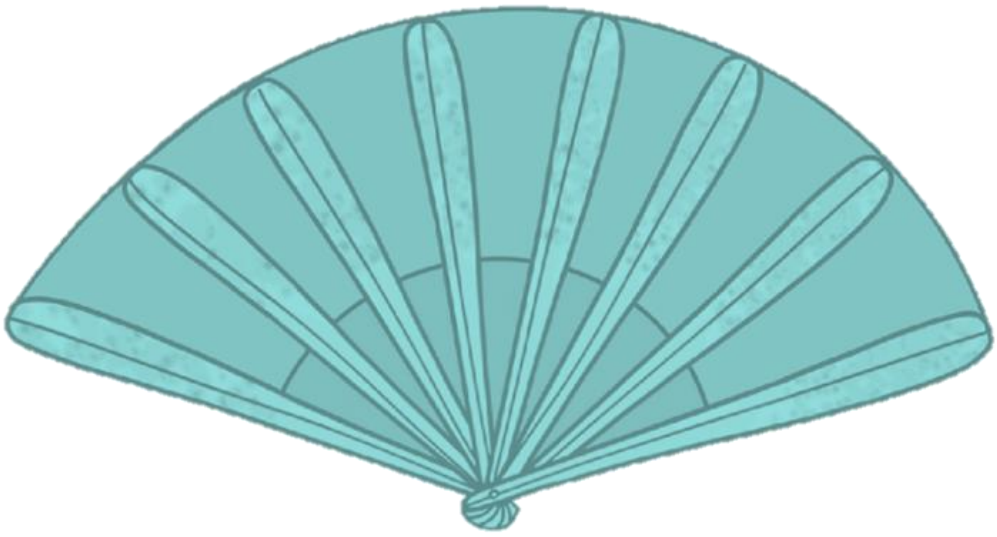
As one of the most successful life forms on our planet, diatoms have adapted their traits and functions to specific habitats. They have often specialized—either through modification or via distinct evolutionary pathways—to meet the demands of their environments. However, we still know very little about how this process of evolutionary specialization has unfolded within diatom clades and lineages, even though it has been well documented in other organisms. Using dated molecular phylogeny and stochastic character mapping, we found evidence of an evolutionary continuum with a transition toward lineage specialization and a canalization toward increased complexity within the family Stauroneidaceae. The pseudoseptum, stauros/fascia, striated stauros/fascia, hymenate areolae, and monophyly do not appear to have been consistently retained in polymorphic ancestral lineages. Over time, modifications in latent development as well as the re-expression of reduced or suppressed traits were integrated into the most highly specialized lineages, *Prestauroneis* and *Capartogramma*, within the family.

July 9th

Session I

Paraninfo – Chairs: Salomé Almeida & David Williams

Hemiciclo – Chairs: Hristina Kochoska & Cüneyt Nadir Solak



Paraninfo / 9:30 – 9:45

T3.6. Diatoms in extreme environments and neglected habitats

ECOLOGY OF DIATOM COMMUNITIES IN MEDITERRANEAN DISCONNECTED POOLS

Quevedo-Ortiz, G.[1,2*], Blanco, S[3]., Cid, N[4]., Crabot, J[5]., Ersoy, Z[1,2]., Fortuño, P[1,6]., Freixinos, Z[7]., Gonzalez-Saldias, Z[1]., López-Rodríguez, M.J[8]., López-Rodríguez, N[1]., Pérez-Lajarín, E[9]., Piñero-Fernández, M[1,2]., Rimet, F[10]., Robles, N[11]., Sánchez Montoya, M.M[9]., Sánchez-Campaña, C[1,2]., Sánchez-Nogueras, J[9]., Soria, M[1,12]., Tierno de Figueroa, J.M[13]., Verdugo Althöfer, M[11]., Gomà, J[1]. & Bonada, N[1,2]

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Disconnected pools are transitional habitats formed as a result of the loss of surface water flow in temporary rivers. They are considered key refuges for aquatic biodiversity during the dry period and play an important role in recolonization after rewetting. Despite their ecological importance, few taxonomic and ecological studies have addressed diatom communities in disconnected pools or the resistance and resilience strategies species use to cope with flow loss and the particular environmental conditions. In order to characterize diatom flora, several surveys of diatoms and environmental conditions were conducted between 2023 and 2024 in disconnected pools across the Mediterranean region of the Iberian Peninsula. Analyses using different microscopy techniques enabled the identification of 385 species, including new

records. Classical and novel functional traits, reflecting resistance and resilience to inhabit disconnected pools, creating the first diatom trait database for this type of habitat. Preliminary results indicate that many species exhibit adaptive traits linked to specific characteristics such as pH variation or pool depth. For the latter, for example, a significant increase in small species is observed as the pools become larger in size. Overall, these findings confirm the ecological relevance of disconnected pools in Mediterranean river ecosystems and highlight the need to preserve and properly manage these habitats, which are often unattended in environmental legislation.

STRONG SPATIAL STRUCTURING OF DIATOM COMMUNITIES ACROSS ANTARCTIC CRYOCONITE HOLES

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Cryoconite holes are water-filled depressions on glacier surfaces that harbor diverse microbial communities, including diatoms. Because of their environmental simplicity and similarity across space, cryoconite holes make excellent model systems for investigating microbial community assembly. Yet, cryoconite diatom communities remain poorly studied, especially in Antarctica. Here, we use cryoconite holes to investigate spatial variation in diatom communities across the Antarctic Peninsula and Continent. Using a combination of microscopy and *rbcL* metabarcoding, we assessed patterns in their diversity and community composition across space.

We found well-developed communities present in the Antarctic Peninsula and parts of West and East Antarctica, while they were absent from the subregions in Queen Maud Land. Communities were dominated by a small number of taxa, with six genera accounting for ~95% of diatom valves. Genera *Psammothidium* and *Humidophila* were the most abundant and widespread, while *Muelleria* and species of *Luticola* showed more restricted distributions. Counterintuitively, genus richness was significantly higher in Continental Antarctica, and strong differences in community composition were present across subregions and even among nearby glaciers. While 44% of genera were shared between regions, nearly 90% of species were region-specific, indicating high taxonomic turnover. Molecular data broadly supported morphological patterns at the genus level, identified 66 diatom ASVs across 13 genera. Dominant genera such as *Psammothidium* showed low ASV diversity, whereas less abundant taxa such as *Nitzschia* exhibited higher ASV diversity.

These results highlight pronounced spatial structuring of cryoconite diatom communities across Antarctica, with differentiation occurring not only between regions but also at fine spatial scales. This suggests that local processes and microhabitat variability may play an important role in shaping these communities, alongside broader biogeographic patterns.

Paraninfo / 9:45 – 10:00

T.3. Ecological function, conservation and communication. Diatoms as ecosystem actors and tools for sustainability

THE DIATOM SIDE OF A TOXIC DINOFLAGELLATE BLOOM: DIVERSITY, DYNAMICS, AND INDICATORS FROM A MEDITERRANEAN REEF

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Diatoms are frequently reported to co-occur with the benthic toxic dinoflagellate *Ostreopsis* and, in some cases, constitute the most abundant component of the microphytobenthos. However, they have rarely been studied in detail, beyond the identification of conspicuous genera (e.g. *Licmophora*, *Coscinodiscus*). As part of the ECOS-COM project, a rocky coast in the northwestern Mediterranean (Sant Andreu de Llavaneres, Catalonia) was sampled monthly over a two-year period to investigate the dynamics of diatom communities in relation to *Ostreopsis* blooms. Highly diverse diatom assemblages were recorded (using both microscopy and *rbcL*-based metabarcoding) and some shown to co-vary with *Ostreopsis* dynamics. For example, *Pteroncola* sp. proliferates in the absence of *Ostreopsis*, *Haslea ostrearia* co-occurs with it, and *Actinocyclus* cf *subtilis* appears at the peak of the bloom. These patterns suggest that *Pteroncola* sp. and *A.* cf. *subtilis* may serve as early indicators of bloom initiation and decline, respectively. At the same time, the ECOS-COM project is providing fundamental knowledge of the diatom diversity of coastal benthic habitats (see Kryk et al., poster on microscopy-based flora), a component of marine ecosystems that remains globally understudied (see Mann et al., oral presentation).

Hemiciclo / 9:45 – 10:00

T3.5. Soil diatoms and their use in bioindication

READING THE SOIL THROUGH DIATOMS: THE SDI (SOIL DIATOM INDEX) AS A SCALABLE BIOMONITORING FRAMEWORK

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The Soil Diatom Index (SDI) is a quantitative transfer function that predicts soil chemical parameters from diatom amplicon sequence variants (ASVs) obtained through metabarcoding, calibrated across 235 sites in Luxembourg. Species ecological optima were derived using TITAN, with predictions generated via weighted averaging (WA) and a WA-PLS(2) extension applied to non-linear gradients. Five gradients achieve SDI Grade I performance (LOO $R^2 \geq 0.50$) — pH, Pb (Geogenic and Anthropogenic) and Ca (labile and residual), confirming that soil diatoms integrate cumulative geochemical conditions over time rather than short-term fluctuations. These core gradients underpin the Composite Environmental Index (CEI), whose first principal component (CEI-1) captures 83.8% of CEI variance along a geogenic-versus-anthropogenic/acidic axis. Land use was found to explain community variance more than three times as strongly as soil chemistry alone, underscoring the added informational value of biological indices relative to conventional physicochemical monitoring. The SDI is directly aligned with soil advisory parameters and broadly covers EU Soil Monitoring Law requirements, positioning it as a biologically grounded complement to standard chemical soil testing. Future applicability rests on three priority actions. First, targeted resampling of extreme-acidic Oesling sites is needed to expand calibration coverage. Second, integration with satellite-derived soil proxies would enable spatial cross-validation at broader scales. Third, longitudinal resampling of sentinel sites would validate the index for dynamic monitoring under the EU Soil Monitoring Law. Underpinning all future applications, soil diatom communities offer a uniquely broad and stable biological signal: distributed across land-use types from arable to riparian, structured by both geogenic and anthropogenic gradients, they constitute a resilient, multi-dimensional fingerprint of soil condition that no single chemical measurement can replicate.

FROM THE ATLANTIC TO THE MEDITERRANEAN: HOW ENVIRONMENTAL FACTORS, COLONISATION KINETICS AND POLYMER TYPE SHAPE DIATOM DIVERSITY IN THE PLASTISPHERE

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Diatoms, despite being the main autotrophs and key early colonizers in biofilms on plastics, currently remain poorly studied compared to other microbes. The identification of the main and specific drivers of their communities at different spatial and temporal scales especially lacks.

249 plastics were immersed at 6 locations across the Atlantic Ocean and Mediterranean Sea in coastal systems of 5 countries. Spatial and seasonal dynamics of plastic-attached diatom communities were investigated by incubating high-density polyethylene (HDPE) at all sites for 84 days. Temporal dynamics (7 days to 12 months) at each season were also investigated with HDPE, polypropylene and polystyrene in Toulon (NW Mediterranean, France). Amplicon sequencing of the rbcL gene allows to determine diatom diversity in parallel to the measure of physico-chemical parameters of the seawater.

Geographic location was the primary driver of diatom diversity, followed by season and incubation time, with intra-site variations always lower than inter-sites ones. Intra-site variations were mostly due to relative abundance changes while

inter-sites variations corresponded to shifts between species. Moreover, biofilms from the Atlantic sites shared neither species nor ASVs, unlike biofilms from the Mediterranean. Pioneer abundant taxa changed from one season to another while mature taxa tended to converge irrespective of the season. Community shaping was observed at different taxonomic levels, down to the genetic variant, highlighting the extent to which genetic divergence occurs. Finally, the nature of plastics plays a minor role, as shown previously for bacteria and fungi in the plastisphere.

Hemiciclo / 10:00 – 10:15

T3.3. Bioindicators in the Water Framework Directive and marine monitoring

REVISION AND VALIDATION OF THE MDIAT FOR ECOLOGICAL STATUS ASSESSMENT OF COASTAL RIVERS IN GALICIA (NW SPAIN)

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The northwestern region of the Iberian Peninsula is characterized by an oceanic climate, granitic geology, and a dense network of rivers and fast-flowing streams. Diatom communities are distinguished by species that are uncommon in the rest of the Iberian Peninsula and highly sensitive to pollution, such as *Navicula angusta*, *Surirella roba*, *Peronia fibula*, and several species of the genus *Eunotia* (*E. subarcuartoides*, *E. minor*, *E. incisa*, *E. exigua*, *E. intermedia*). Diatoms were used to assess the ecological status of 72 Galician rivers in project conducted between 2002-2004, and the results indicated that IPS index did not adequately respond to the impacts affecting streams and rivers in this region. Consequently, a new multimetric index, MDIAT, was developed in accordance with the requirements of the Water Framework Directive (WFD), using several indices calculated with Omnidia v. 3.6 and two metrics based on sensitive species in Delgado et al. (2010).

Twenty years after, we conducted a revision and validation of this metric using data from 2002–2004 and incorporating new datasets from two additional projects carried out in summer in coastal Galicia in recent years 2022 (n = 55) and 2025 (n = 30). A total of 148 diatom samples were used to calculated OLD MDIAT with eight metrics and NEW MDIAT that included four of these metrics. A revised version of the MDIAT index was proposed because several of the indices used in its original formulation are no longer computed in recent versions of Omnidia software.

A linear regression analysis was performed to compare the Ecological Quality Ratio (EQR) values obtained from both metrics. Regression analysis confirmed the validity of the metric, with a high correlation coefficient (r = 0.9276) indicating that the NEW_MDIAT index can reliably be used for the assessment of ecological status of Galician rivers.

Paraninfo / 10:15 – 10:30

T.3.2. Epiphytes and symbionts: microhabitats and ecological relationships

EPIPHYTIC DIATOMS ASSOCIATED WITH THE INVASIVE ALGA SARGASSUM MUTICUM

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The invasive brown macroalga *Sargassum muticum* has a strong impact on coastal ecosystems by altering habitat structure and associated epiphytic communities. This study investigated epiphytic diatom assemblages colonizing *S. muticum* collected from a shallow coastal site in Chioggia, Italy. Samples were collected in triplicate directly from the shoreline, and diatoms were removed by scraping the algal surface. The material was suspended in distilled water, fixed in 4% formaldehyde and analyzed using light microscopy. Identification was performed to the lowest possible taxonomic level based on morphological features. A total of 33 diatom taxa were identified, distributed across six classes, 15 orders, and 17 families, indicating high taxonomic diversity. Bacillariophyceae remained the dominant class (18 taxa, 54,55%), followed by Fragilariophyceae (8 taxa, 24,24%). Melosirophyceae accounted for 4 taxa (12,12%), while Thalassiosirophyceae, Leptocylindrophyceae and Striatellaphyceae were each represented by a single taxon (3.03% each). Pennate diatoms predominated (27 taxa, 81,82%), including species such as *Achnanthes longipes, Bacillaria paxillifera, Cylindrotheca closterium, Hantzschia marina*, and several *Nitzschia* species, which are typically associated with dynamic and nutrient-rich environments. The occurrence of several *Cocconeis* species highlights the importance of epiphytic forms attached to substrates. Genera such as *Navicula*, *Gyrosigma*, and *Pleurosigma* indicate a strong benthic affinity, while *Surirella* (*S. fastuosa*, and *S. linearis*) and *Entomoneis paludosa* reflect tolerance to variations in salinity and organic matter. Fragilariophyceae comprised colonial and stalked taxa, including *Tabularia fasciculata, Ulnaria ulna*, and several *Licmophora* species, all well adapted for attachment to macroalgae. In contrast, centric diatoms (6 taxa, 18,18%), including *Melosira lineata, Melosira nummuloides, Paralia sulcata, Proboscia alata*, and *Cyclotella striata*, indicate a comparatively smaller but still relevant planktonic contribution to the assemblage. Overall, the assemblage shows high functional diversity, indicating that *S. muticum* acts as a heterogeneous substrate that promotes biodiversity and connectivity between benthic and pelagic compartments.

These findings are important for understanding the ecological impacts of invasive species at a micro-scale, contributing to knowledge of microalgal community dynamics in coastal ecosystems.

Hemiciclo / 10:15 - 10:30

T3. Ecological function, conservation and communication. Diatoms as ecosystem actors and tools for sustainability

IMPLEMENTING FRESHWATER PROTECTED AREAS: INTEGRATING ECOLOGICAL INDICATORS, GOVERNANCE AND POLICY FRAMEWORKS

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Freshwater ecosystems are among the most threatened, yet practical guidance for implementing freshwater protected areas remains limited. While conservation planning for terrestrial and marine systems is supported by well-established frameworks, freshwater conservation often lacks structured implementation models capable of linking ecological prioritization with governance arrangements and operational management processes. This study develops and evaluates a conceptual framework designed to support the implementation of freshwater protected areas. The framework integrates ecological assessment, governance structures, and sequential implementation phases intended to guide freshwater conservation initiatives from prioritization to operational management. In this context, ecological assessment and monitoring components explicitly encompass biological indicators, including diatom-based bioindicators widely used in freshwater ecological status assessment under legislation such as the Water Framework Directive. The framework was evaluated through a structured expert elicitation process involving specialists in freshwater ecology, conservation planning, and environmental governance. Experts assessed the framework using Likert-scale questions and provided qualitative feedback through open-ended comments. Quantitative results indicated high levels of agreement regarding framework completeness, conceptual clarity,

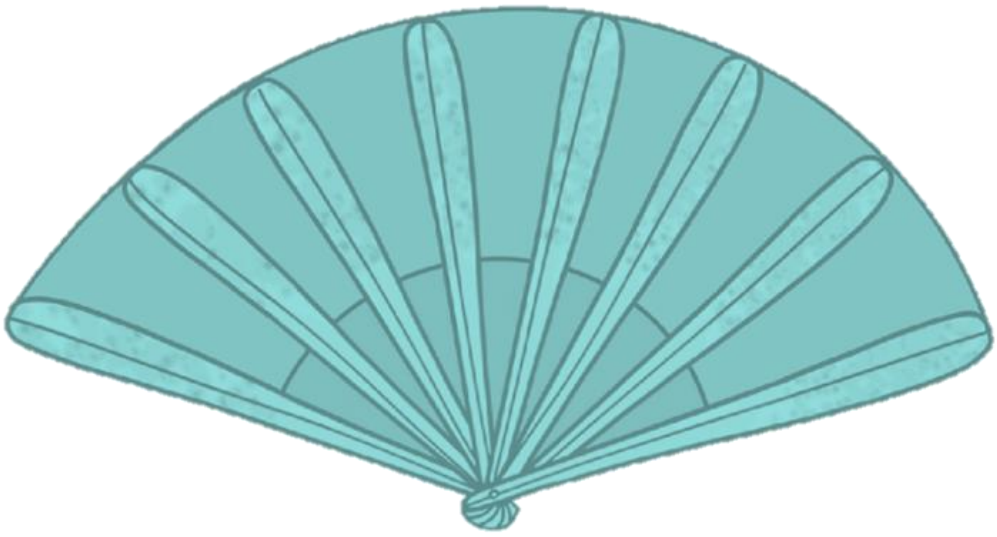
policy relevance, and internal coherence. Qualitative analysis of expert feedback (479 comments) led primarily to clarity refinement and operational improvements without requiring structural modifications to the framework. The refined framework emphasizes governance and stakeholder participation as cross-cutting elements and proposes a structured sequence of phases linking ecological prioritization, legal designation, and adaptive management. By integrating ecological knowledge, including bioindicator-based assessment (e.g. diatom assemblages), with governance processes and implementation dynamics, the framework contributes to bridging a critical gap between freshwater conservation science and operational policy implementation. Such structured approaches may support more effective design and implementation of freshwater protected areas within broader freshwater conservation and monitoring strategies.

July 9th

Session II

Paraninfo – Chairs: David G. Mann & Carlos E. Wetzel

Hemiciclo – Chairs: Joan Gomá & Elena Pérez-Rubín Jiménez



Paraninfo / 11:00 – 11:15

T3.6. Diatoms in extreme environments and neglected habitats

SEASONAL DYNAMICS OF BENTHIC DIATOM COMMUNITIES IN SALINE LAKES: A METABARCODING AND MICROSCOPY APPROACH

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Benthic diatoms play a crucial role in nutrient cycling and serve as sensitive indicators of environmental change in lake ecosystems, yet their seasonal dynamics remain relatively understudied compared to phytoplankton. In this study, we examined seasonal changes in benthic diatom communities in two saline lakes in Serbia, Plava Banja and Pečena Slatina, using metabarcoding and microscopy across three seasons (spring, summer, and autumn) during 2023 and 2024.

Seasonal variation in environmental conditions differed between lakes, showing a strong and significant effect in Pečena Slatina, while the effect in Plava Banja was weak and not statistically significant. RDA analysis with permutation tests for both methods indicated that diatom community composition in Plava Banja was primarily influenced by conductivity, pH, and ammonium, whereas in Pečena Slatina, ammonium was the main driver, followed by conductivity.

Both approaches showed that *Nitzschia* taxa were dominant in spring in Plava Banja, followed by a decrease in summer and autumn, when they were replaced by *Craticula* taxa. This trend slightly differs in Pečena Slatina, with *Nitzschia* taxa being dominant in spring but making a reappearance again in autumn. *Craticula* was nearly absent as a dominant taxa in spring, increased in summer according to metabarcoding, and peaked in autumn in microscopy. *Anomoneis* was consistently detected as dominant by metabarcoding, while microscopy recorded high abundance only in spring 2023.

PERMANOVA revealed significant seasonal variation in diatom community composition across both lakes and methods. Pairwise comparisons across all samples showed that spring communities differed from both summer and autumn, while no differences were detected between summer and autumn.

Overall, these results demonstrate strong seasonal structuring of benthic diatom communities, with consistent seasonal shifts in dominant taxa detected by both

metabarcoding and microscopy, highlighting the importance of these communities for understanding ecosystem dynamics in saline lakes.

Hemiciclo / 11:00 – 11:15

T3.1. Role of diatoms in food webs and biogeochemical cycles

BEYOND STRUCTURE AND ENERGY STORAGE - EXPLORING THE FUNCTIONS OF EXTRACELLULAR DIATOM POLYSACCHARIDES

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Diatom-derived complex anionic polysaccharides play a key role in marine carbon sequestration. As biological adhesives, these polysaccharides are pivotal to marine particle formation, and their complex structures make them challenging to degrade by microorganisms. Yet, these polymers are largely unknown, and their functions are elusive due to analytical constraints. Here, we present a workflow combining anion-exchange chromatography and mass spectrometry to purify and analyze distinct anionic polysaccharides from the diatom *Conticribra weissflogii*. We find that *C. weissflogii* produces three anionic polysaccharides of varying complexity: one fucogalactan and two mannans. Moreover, we can show that *C. weissflogii* modulates its secretion in response to light, nutrients, temperature, pH, and growth state. Light, temperature, pH, and growth state influence the total amount of secreted polysaccharides. In contrast, nutrient limitation evokes differential secretion of individual polysaccharides. This points to anionic polysaccharides as sensitive response-agents with different functions and priorities to the diatom. In conclusion, our workflow opens the door to studying overlooked diatom-derived anionic polysaccharides, an untapped pool of dissolved organic matter crucial to understanding the fate of carbon in the ocean.

Paraninfo / 11:15 – 11:30

T3.6. Diatoms in extreme environments and neglected habitats

CLIMATE-DRIVEN ALTERATIONS IN ARCTIC LIGHT REGIMES RESHAPE DIATOM PHYSIOLOGY AND PHENOLOGY

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The Arctic Ocean has been affected by climate change. Increase of light under sea-ice induced by snow cover loss is expected to enhance phytoplankton growth in the water column underneath the ice. In this experimental study, we investigated the impact of the light regime (intensity and photoperiod) on arctic diatoms ecophysiology. Five key species (*Chaetoceros neogracilis*, *C. gelidus*, *Thalassiosira gravida*, *Pseudo-nitzschia arctica* and *Fragilariopis cylindrus*) that occupy distinct ecological niches across seasonal succession. Theses representative species were grown under different light *scenarii*, mimicking the under ice light environment in April-May (1.3 mol photons m^{-2} d^{-1}), May without snow cover (4.3 mol photons m^{-2} d^{-1}) and June-July (17.3 mol photons m^{-2} d^{-1}) in Qiqiktarjuaq (Nunavut, Canada, 67°N 28'22 63°W57'00). Our findings suggest that increasing light conditions may negatively affect the growth of ice-associated diatoms *P.-n. arctica* and *F. cylindrus*, reflecting their specialization to low-light sea-ice habitats, with complete growth inhibition observed at 4.3 mol photons m^{-2} d^{-1}. This suggests that these species are highly adapted to low-light environments and may be particularly vulnerable to enhanced irradiance associated with earlier snow cover melting and/or sea-ice retreat. In contrast, *T. gravida* exhibited enhanced growth at 4.3 mol photons m^{-2} d^{-1}, a light level consistent with projected early sea-ice opening in April–May under future climate *scenarii*. However, under these conditions, *T. gravida* appears to reach light saturation, associated with a decline in carbon-rich exopolymer production. Meanwhile, the open-water species *C. gelidus* and *C. neogracilis* are expected to remain light-limited during early sea-ice opening in April–May, leading to increased carbon-rich exopolymer production. Together, these findings indicate that shifts in light availability driven by earlier sea-ice retreat could restructure species-specific growth responses and carbon allocation strategies, with important implications for Arctic marine biogeochemical processes.

Hemiciclo / 11:15 – 11:30

T3.1 Role of diatoms in food webs and biogeochemical cycles

QUANTIFYING SINGLE-CELL ELEMENTAL QUOTAS OF DIATOMS TO ASSESS BIOGEOCHEMICAL EXPORT FLUXES IN THE DENMARK STRAIT

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The Denmark Strait is a critical gateway between the Arctic and the subpolar North Atlantic, playing a crucial role in global thermohaline circulation. There, cold dense water masses formed in the Nordic Seas overflow into the north Atlantic, and warm and saline Atlantic water is transported northwards. Diatoms are the dominant drivers of the biological carbon pump (BCP) in these high-latitude regions, acting as key organic carbon and biogenic silica vectors to the ocean interior. Studying the elemental composition of the species involved is fundamental, as BCP efficiency varies significantly depending on their Si:C ratios, frustule thickness, and life strategies.

In this study, we investigate the elemental composition of sea surface and sinking diatoms in this region during summer 2023. Alive diatom cells were collected at the chlorophyll maximum, and sinking cells were captured using a sediment trap deployed at 1878 m water depth. Cells were concentrated onto a 20 µm nylon mesh, washed to remove salts and placed on a Cu grid coated with formvar. Elemental single-cell quotas were obtained by X-ray microanalysis (XRMA) in a Field Emission Scanning Electron Microscope (FESEM) equipped with 2 high-resolution energy-dispersive spectrometers. Using XRMA, we quantified the elemental quotas (C, N, P, Si, S, in pg cell^{-1}) of several taxa, including *Thalassiosira* spp., *Fragilariopsis* spp. and *Chaetoceros* resting spores. Since this is a single-cell methodology, we avoided the overestimation of C and N quotas associated with bulk analyses due to the inclusion of abiotic material and organic debris.

Our results allow a direct comparison between surface and exported sinking diatoms, highlighting how species-specific traits and life stages shape export efficiency. These findings contribute to improving the representation of diatom stoichiometry in global biogeochemical models and advance understanding of carbon and silica cycles.

Ultimately, they improve predictions of how the biological pump in this sensitive subpolar region may respond to ongoing climate-driven change.

Paraninfo / 11:30 – 11:45

T3.6 Diatoms in extreme environments and neglected habitats

SHRINKING GLACIERS SHAPE ALPINE GLACIER-FED STREAM DIATOM COMMUNITIES: INSIGHTS FROM DNA METABARCODING

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Glaciers are shrinking rapidly across the European Alps, altering the hydrology and ecology of glacier-fed streams (GFSs). Despite being highly dynamic and extreme environments, GFSs represent a largely understudied habitat. Furthermore, while diatoms are widely used as bioindicators, their response to glacier shrinkage in these harsh systems remains uncertain, particularly through the lens of environmental DNA. Here, we investigated how glacial retreat shapes diatom diversity and community structure by sampling benthic biofilms from 26 Alpine GFSs. We estimated photoautotrophic biomass via sediment chlorophyll-a concentrations and characterized diatom communities using 18S and *rbcL* metabarcoding, alongside morphological assessments of a viable subset.

Methodological comparisons revealed that metabarcoding uncovered diversity not readily captured by microscopy, particularly among small, lightly silicified genera easily obscured by fine glacial sediments. Ecologically, our results demonstrate that turbidity strongly constrains photoautotrophic biomass, while higher water temperature promotes diatom alpha diversity. Furthermore, redundancy analyses (RDA) revealed that a Glacial Index (accounting for both glacier size and proximity) and turbidity were consistently among the best explainers of community structure for both genetic markers.

Indicator species analyses highlighted a clear ecological transition: sites under strong glacial influence were characterized by small, adnate lineages putatively adapted to solitary life and regular physical disturbance (e.g., *Achnanthidium*, *Navicula*). Conversely, sites under reduced glacial influence supported more complex, higher-diversity assemblages with characteristic species often exhibiting colonial or stalked lifestyles (e.g., chain-forming *Diatoma*).

Overall, these findings suggest that glacial retreat will increase diatom alpha diversity and fundamentally reorganize the communities inhabiting Alpine GFSs.

For future monitoring, integrating these molecular tools with traditional morphological baselines will provide a robust framework for tracking these critical biological shifts in sensitive freshwater ecosystems.

Hemiciclo / 11:30 – 11:45

T3.1 Role of diatoms in food webs and biogeochemical cycles

SMALL WARMING, BIG SHIFT: TEMPERATURE-INDUCED TRANSITION FROM CARBON SINK TO SOURCE IN DIATOM-DOMINATED INTERTIDAL SEDIMENTS ALONG EUROPEAN SHORELINES

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Estuarine and coastal intertidal zones rank among the most productive ecosystems on Earth, largely driven by microphytobenthic biofilms dominated by diatoms. These assemblages sustain primary production in unvegetated sediments and support key ecosystem services, including carbon sequestration and coastal trophic networks. However, ongoing climate change is exerting increasing pressure on these systems, notably through rising temperatures. Global mean surface temperature has already increased by approximately 1.1–1.3°C above pre-industrial levels, accompanied not only by gradual warming but also by more frequent and intense thermal anomalies such as heatwaves.

Understanding how temperature affects microphytobenthic productivity and its role in biogeochemical cycles, particularly carbon cycling and storage, is essential for improving predictive ecological models. Yet, available data on the thermal optima of microphytobenthic photosynthesis remain geographically restricted, overlooking potential spatial variability in responses.

To address this gap, we conducted a series of experiments exposing intertidal sediments collected across five European locations (the Scheldt Estuary, the Bay of Brest, the Loire Estuary, the Ria de Aveiro, and the Bay of Cádiz) to a controlled temperature gradient (3°C h^{-1} over a 24°C range). We monitored biomass (NDVI), photosynthetic productivity (PAM fluorometry), and carbon fluxes

(benthic chambers) under rising temperatures in controlled temperature–light chambers during the light phase of a light–dark cycle.

Our results show that increases in temperature only slightly impacted microphytobenthic biomass and photosynthetic rates. Contrastingly, it strongly influenced carbon fluxes, revealing a threshold beyond which respiration exceeds photosynthetic carbon fixation. This imbalance, dependent on initial microphytobenthic biomass, drives a shift from net carbon sinks to carbon sources. Overall, these findings demonstrate that even moderate temperature increases can trigger significant changes in ecosystem carbon dynamics and associated services, providing valuable insights for predicting the future of European mudflats under climate change and informing conservation and management strategies for these valuable ecosystems.

Paraninfo / 11:45 – 12:00

T3.6 Diatoms in extreme environments and neglected habitats

BIOGEOGRAPHIC CONTRASTS IN SOIL DIATOMS: FROM ANTARCTIC ENDEMISM TO BIPOLAR DISTRIBUTION

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Understanding the processes that shape species distributions and speciation is a major goal of evolutionary biology, yet they remain largely unresolved for protists. The existence of biogeographic patterns in protists has long been disputed by the ubiquity hypothesis, which states that microbial taxa are globally dispersed due to minimal dispersal barriers, minimising the role of historical and geographic processes. However, increasing evidence of restricted distributions and endemism challenges this view. Yet, genome-scale analyses aimed at unravelling the drivers behind biogeographical patterns and speciation in protists remain rare.

Here, we leverage whole-genome data from a set of sister taxa within the terrestrial diatom species complex *Pinnularia borealis* to unravel patterns of population structuring, gene flow, long-distance dispersal, and speciation in soil diatoms. To this end, we performed whole-genome resequencing of >60 strains sampled across the Northern and Southern Hemispheres, with a focus on the Arctic and Antarctic regions. Following the identification of single nucleotide polymorphisms, a principal component analysis, phylogenetic inference, and sparse non-negative matrix factorisation (sNMF) revealed the presence of several species with contrasting geographic distributions – from endemism in Antarctica to a widespread bipolar distribution. Despite evidence for ongoing gene flow, the bipolar species shows distinct genetic differentiation across the Northern and Southern Hemispheres. Furthermore, elevated admixture in Patagonian strains is suggestive of stepping-stone-mediated long-distance dispersal.

Together, these findings show that both long-distance dispersal and dispersal limitations contribute to shaping microbial distributions, highlighting the complexity of microbial biogeography.

Hemiciclo / 11:45 – 12:00

T3.6. Diatoms in extreme environments and neglected habitats

EXPLORING THE IN VIVO OPTICAL PROPERTIES OF THE BENTHIC PENNATE DIATOM PLEUROSIGMA STRIGOSUM IN SUBTIDAL SEDIMENTS: CHARACTERISTICS, ORIGINS, AND POSSIBLE BIOLOGICAL ROLE

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Microphytobenthos (MPB) is a significant contributor to marine primary production, especially in tidal flats and shallow subtidal sediments. It is dominated by benthic motile diatoms, microalgae that possess a distinctive cell wall composed of hydrated amorphous silica called the frustule. Diatoms prove surprisingly efficient at photosynthesis, despite the extreme and widely varying light conditions of their ecosystems. Previous research has shown that centric diatom frustules could be assimilated to photonic crystals and possessed optical properties that could explain diatoms' adaptation to harsh light environments. In this study, we investigated the optical properties of a large-sized pennate diatom, *Pleurosigma strigosum,* originally found in benthic communities at 10 meters depth. This study showed novelty in studying optical properties *in vivo* and in seawater, which had never been done before. After characterization of the strain, we performed optical measurements of cells using a custom-built inverted microscope coupled with a camera and piezoelectric motor. Measurements were compared with numerical simulations, and artificial diatoms were fabricated using multiphoton polymerization photoplotting. We found that live pennate cells in seawater focussed light on average 53 µm below them while empty frustules and centric diatoms did not. Thus, focussing seemed to rely on overall cell shape and content. We also noticed a variation of the focal distance according to wavelength: red light was focussed farther than blue and green light. Finally, we documented an absence of light modulation from the micro and nanostructures at the surface of the frustule. From these results, we suggest a link between the cells' ability to focus light below them and their photosynthetic efficiency, notably for light exposure regulation in dense biofilms forming at the surface of subtidal sediments.

Paraninfo / 12:00 – 12:15

T3. Ecological function, conservation and communication. Diatoms as ecosystem actors and tools for sustainability

THE POTENTIAL OF THE DIATOM GUILD MEMBERSHIP AS AN INDICATOR OF BIOFILM RESPONSES TO DROUGHT AND RECOVERY

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Freshwater diatoms, one of the most diverse groups of microalgae are key primary producers in food webs of aquatic ecosystems. Given this diversity, considering traits rather than species can enhance our understanding of the ecological responses of freshwater benthic diatoms to their environment, biotic interactions and community structure. As anthropogenic climate warming is intensifying, such approaches can facilitate predictions of how biofilm communities will respond to various pressures, such as drought. Adopting diatom guild membership as a widely used trait-based approach in diatom ecology, our project investigates hypotheses related to stressor effects and interactions, as well as the speed of community recovery. In particular, we are interested in the responses and recovery of freshwater benthic diatom communities to warming and drought. By applying a combination of different geographic and temporal scales and levels of ecological realism, we monitor their response in laboratory and outdoor stream mesocosm experiments, as well as in field studies. To improve predictive modeling of diatom community re-assembly after stressor exposure, we test the potential of diatom guild membership to capture taxonomic variability in 1) drought tolerance, 2) biotic interactions and 3) priority effects (i.e., the influence of species arrival order on community assembly) by conducting highly controlled lab experiments using simple artificial communities composed of selected strains.

Hemiciclo / 12:00 – 12:15

T3.6. Diatoms in extreme environments and neglected habitats

STOCHASTIC AND DETERMINISTIC PROCESSES INFLUENCING MOUNTAIN MIRE DIATOM COMMUNITIES ACROSS SPATIAL SCALES

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Disentangling the relative influence of deterministic and stochastic processes on microbial community assembly across spatial scales is essential to understanding biodiversity patterns. Mires are nutrient-poor and heterogeneous wetlands that form isolated habitats supporting highly diverse diatom assemblages, particularly in mountainous areas, allowing the evaluation of dispersal and species sorting forces. Diatoms are known as ubiquitous microalgae that disperse passively and whose community can endure changing environmental conditions. While their diversity is well documented, the mechanisms driving diatom community assembly across spatial scales remain unclear. Here, we quantified the influence of ecological drift, environmental selection, and dispersal following a null-modelling procedure based on morphology-based phylogenetic distance (βNTI) and compositional turnover (RC_{Bray}) from diatom communities in 18 mountain mires across four Iberian National parks using a hierarchical spatial design; local (within mire): <1 km, landscape (within National park): 1.5–45 km, and regional (Iberian Peninsula): 200-800 km (between National parks). Our results reveal a spatial continuum in community organization, shifting from a predominance of homogenizing dispersal at local scales (explaining up to 55.6 ± 28.5% of community variation) to ecological drift (27.8 ± 24.7%) and heterogeneous selection (environmental filtering) (22.5 ± 10.0%) at landscape and regional scales. These findings shed light on the scale-dependent interplay of community assembly processes in shaping diatom biodiversity in aquatic ecosystems, highlighting how the balance between stochastic and deterministic processes shifts across multiple spatial scales.

Paraninfo / 12:15 – 12:30

T3.6. Diatoms in extreme environments and neglected habitats

A TAXONOMICAL AND MOLECULAR APPROACH ON SOME NEW TAXA FROM HIGHLY ALKALINE SPRING IN TÜRKIYE

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Göydün spring is one of the numerous water sources for the Kızılırmak River, which at 1 355 km is the longest river in Türkiye. The spring is located near the city of Sivas in Eastern Anatolia. Higly alkaline (pH 9.8) and halophylic Göydün spring is formed from a karstified gypsum formation aquifer with an average discharge of 1.10 m^3/s. The spring is not sustained by precipitation, thus ground water is the sole source rich in dissolved solids with average electrical conductance around 13000 µS/cm.

The major cations in the water are Ca^{2+} and Na^{+} associated with the anions SO_4^{2-} and Cl^{-}. The waters are considered halophylic and impact the salinizarion of the immediate Kızılırmak River. The samples were collected in June 2020, September 2020, April 2021, July 2024 and April 2025 from epilithic substrata. This study introduces some new taxa in *Ctenophora, Halamphora Craticula,Navicula, Pinnularia* and *Tabularia* genera.

Paraninfo / 12:30 – 12:45

T3.6. Diatoms in extreme environments and neglected habitats

DEALING WITH LIGHT: COMPARATIVE PHOTOPHYSIOLOGICAL RESPONSES OF INTERTIDAL AND SUBTIDAL PLEUROSIGMA STRIGOSUM INHABITING SEDIMENT OF THE BAY OF BREST.

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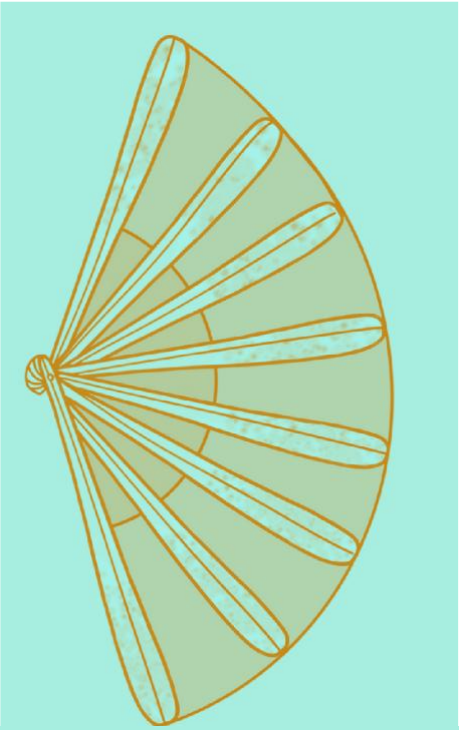
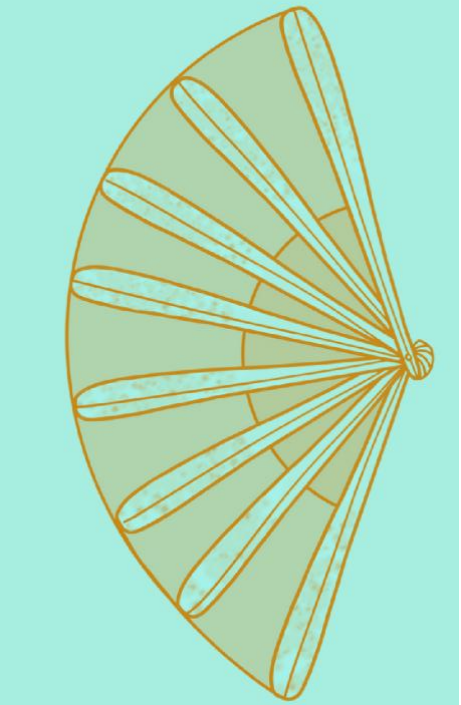
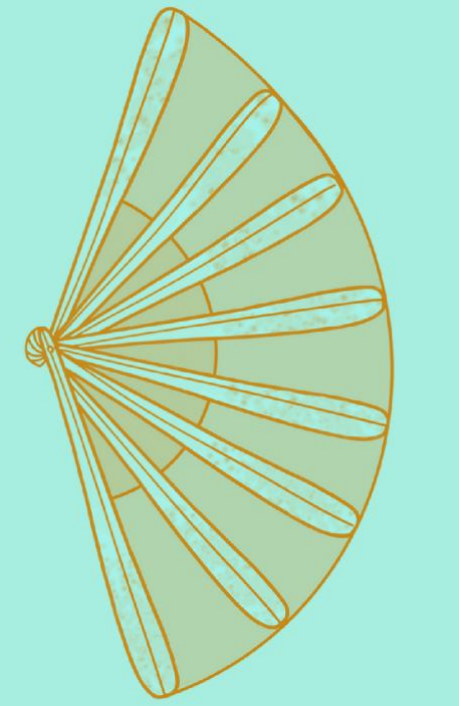
The microphytobenthos (MPB) is a key contributor to coastal primary production. MPB is mainly composed of benthic motile diatoms located on the surface of sediments such as mudflats. Despite their central role in coastal functioning estuarine sediment, MPB remains understudied. Exposed to a complex and dynamic light environment, these diatoms receive varying quantities and qualities of light depending on their habitat (intertidal or shallow subtidal), the photoperiod, and the tidal cycle (high or low tide). To understand growth, light harvesting, and photoprotection mechanisms in such an environment, we investigated the photophysiological responses of a benthic diatom, *Pleurosigma strigosum*, isolated from intertidal (intense and highly variable light exposure) and subtidal (low and stable light exposure) MPB communities. The two strains were exposed to three light conditions: low-intensity white light (WL), high-intensity white light (WH), and low intensity blue light (BL). Analyses of growth, pigment composition, photosynthetic and photoprotection (NPQ) parameters, elemental composition, and biogenic silica content were conducted. The intertidal strain displayed a high-growth phenotype and elevated carbon content, yet exhibited a low chlorophyll *a* and biogenic silica levels, along with stable photoprotection mechanisms. These traits suggest an adaptation to highly variable light conditions. In contrast, the subtidal strain exhibited a higher concentration in chlorophyll *a* and biogenic silica, but lower growth rates. Its photoprotection mechanisms varied depending on the light climate, reflecting greater photosynthetic efficiency and plasticity, which optimizes light capture in low light environment. This study reveals distinct physiological responses between two strains of the same species from different light sediment habitats.







POSTER SESSIONS

MARINE BENTHIC DIATOM DIVERSITY IN THE ADRIATIC SEA: A SYNTHESIS OF CURRENT KNOWLEDGE

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Despite more than three decades of research, knowledge of the composition and spatial distribution of marine benthic diatoms along the Adriatic Sea remains incomplete. This study presents a comprehensive checklist and distribution overview of marine benthic diatom taxa in the Adriatic sub-basin of the Mediterranean Sea, based on an extensive review of available literature. Taxonomic nomenclature has been updated using AlgaeBase (Guiry & Guiry 2024) and Kociolek et al. (2024) to minimise synonymy and misidentifications.

A total of 822 species belonging to 163 genera and 70 families were recorded, with pennate diatoms comprising the majority (719 species). The most diverse families were Naviculaceae (95 taxa) and Bacillariaceae (88 taxa), while Naviculaceae (8 genera), Bacillariaceae (7), Surirellaceae (6), and Fragilariaceae (6) showed the highest generic diversity. The most species-rich genera included *Mastogloia*, *Navicula*, *Nitzschia*, *Amphora*, *Diploneis, Cocconeis, Halamphora, Achnanthes, and Licmophora*.

The analysis highlights uneven research coverage across the Adriatic, indicating that many areas remain insufficiently studied. Nevertheless, this work represents the first consolidated and updated checklist for the region, providing a valuable baseline for future investigations. Continuous integration of new taxonomic and distributional data will enhance our understanding of microalgal diversity and contribute to improved ecological assessments of coastal ecosystems.

P2 – Marine Ecology

SPATIAL DISTRIBUTION OF DIATOM COMMUNITIES ALONG A TRANSECT IN THE OPEN SOUTHERN ADRIATIC SEA

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The Adriatic Sea is a semi-enclosed basin in the eastern Mediterranean, with its deepest part (~1250 m) located in the southern Adriatic. The open Southern Adriatic (OSA) is generally considered oligotrophic, although recent studies suggest it is not exclusively so. The region is typically characterized by low phytoplankton biomass and the dominance of small size fractions (nano- and picophytoplankton). Phytoplankton blooms mainly occur in spring and autumn, although winter blooms may develop under favorable hydro-meteorological conditions, such as strong vertical mixing induced by *bura* wind or intrusions of different water masses. Sampling was conducted along a transect in the OSA in September 2023 at four stations (P-100, P-150, P-300, and P-1200; station labels indicate depth), including 35 phytoplankton samples. A deep chlorophyll maximum (DCM) was detected at 50–70 m depth, with chlorophyll *a* concentration ranging from 0.25 to 0.5 mg m^{-3}. In total, 48 diatom taxa (species and intraspecific taxa) were recorded. The highest diversity and abundances were observed at station P-100, where the dominant taxa were *Asterionellopsis glacialis*, *Bacteriastrum furcatum*, *Bacteriastrum hyalinum*, *Chaetoceros diversus*, *Leptocylindrus mediterraneus*, *Pseudo-nitzschia* spp., *and Thalassionema nitzschioides*. A similar diatom community composition was observed at stations P-150, P-300, and P-1200, with *Asterolampra grevillea*, *Hemiaulus hauckii*, *Navicula* spp., *Thalassionema nitzschioides*, and unidentified pennate diatoms as the prevailing taxa. Nutrient concentrations were within the range typical for the oligotrophic open Southern Adriatic, with the lowest values recorded at station P-100, likely reflecting enhanced phytoplankton production and nutrient uptake. Phytoplankton production and biodiversity in the southern Adriatic are influenced by hydro-meteorological conditions and Bimodal Oscillating System (BiOS) driven water mass inflow, alternating between Levantine nutrient-poor and Atlantic-influenced nutrient-rich waters.

MORPHOLOGICAL, MOLECULAR AND GENOMIC INVESTIGATIONS OF THE BIODIVERSITY OF DIATOMS FROM THE CAN GIO MANGROVE BIOSPHERE RESERVE, VIETNAM

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In the frame of an ongoing PhD thesis, several water and sediment samples have been collected from various sites within the Can Gio mangrove biosphere reserve (Vietnam), an area that has been undergoing a vast reforestation programme since the end of the 1970s.

A total of 180 diatom strains (53 centric and 127 pennate) have been isolated, identified by means of light and scanning electron microscopy, and are currently being maintained in culture. A molecular barcoding framework has been initiated on these strains, based on the commonly used markers *rbc*L, *psbC*, and SSU.

In addition, we selected several strains belonging to genera that are poorly documented from a genomic point of view to obtain their organellar genomes from them. Plastomes and mitogenomes were thus sequenced for the genera *Pleurosira*, *Actinoptychus*, *Microcostatus*, *Fallacia*, *Biremis*, *Caloneis*, *Karayevia* and *Envekadea*.

This study provides insights into diatom diversity in mangrove ecosystems and also valuable molecular and genomic data to be later used in phylogeny, studies on dynamics of organellar genome and metabarcoding monitoring of the mangrove.

P4 – Marine Ecology

BENTHIC DIATOM FLORA FROM THE MAR MENOR COASTAL LAGOON (SE SPAIN): BIODIVERSITY HOTSPOT IN A EUTROPHICATED TRANSITIONAL SYSTEM

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Coastal lagoons are highly dynamic transitional ecosystems that support exceptional biodiversity and represent hotspots for discovery of new taxa. Despite the ecological relevance of benthic diatoms as primary producers and sensitive bioindicators, their taxonomic diversity in Mediterranean lagoons remains insufficiently documented. The Mar Menor (SE Spain), one of the largest hypersaline coastal lagoons in the Mediterranean Sea, represents a particularly valuable but threatened system. Historically dominated by *Cymodocea nodosa* and *Caulerpa prolifera* meadows, it has undergone recurring eutrophication crises since 2015 driven by nutrient runoff from intensive agriculture, resulting in the loss of up to 85% of macrophyte cover and restructuring of benthic habitats. This study provides a comprehensive illustrated checklist of benthic diatoms from the Mar Menor, based on epiphytic and epilithic samples collected across ten localities, representing gradients of environmental conditions and anthropogenic impacts, between 2008 and 2021. Frustules were examined using light microscopy and scanning electron microscopy, and taxa were identified following current systematic frameworks. A total of 125 taxa belonging to 60 genera were recorded, including 63 new reports for the lagoon and 20 taxa not previously documented for Spain. Several records correspond to recently described species, extending their known geographical distribution. The most diverse genera were *Halamphora* (15 taxa), *Nitzschia* (11), *Amphora* (7), *Licmophora* and *Navicula* (6 each). Ten morphotypes could not be assigned to species level, highlighting the need for integrative morphological and molecular approaches. Assemblages reflected the broad environmental gradients of the lagoon, including halophilic, euryhaline, pollution-tolerant and freshwater-influenced taxa co-occurring, consistent with the current transitional and hydrologically dynamic nature of the system. This work provides a taxonomic baseline for future ecological assessment and long-term monitoring programs, and underscores the value of classical taxonomy in documenting biodiversity in threatened Mediterranean transitional ecosystems.

P5 – Marine Ecology

DIATOM ABUNDANCE AND DIVERSITY IN SHALLOW COASTAL SEDIMENTS ALONG THE SWEDISH COAST

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Diatoms are essential in the marine carbon cycle. They make up about 30-40% of marine carbon fixation and outperform all tropical rainforests combined in global carbon fixation. Coastal regions show much higher productivity per area than the open ocean, with diatoms playing a key role in carbon fixation on rock ("hard substrate") as well as in and on sediments ("soft substrate"). When growing as epiphytes on macroalgae on hard substrates or seagrasses on soft substrates, carbon fixation by epiphytic diatoms usually exceeds that of their host macrophytes many times.

The Baltic Sea is a semi-enclosed basin with a stable salinity gradient from the Danish Straits (salinity 20-15) to the northern Bothnian Bay (salinity 3-0). Extensive sand- and mudflats dominate the southern and southeastern coasts, where diatom productivity and diversity are well-studied. In contrast, the northwestern coasts of the Baltic Sea (the Swedish east coast) feature a "mixed substrate," consisting of bedrock, stones, pebbles, and sediment in varying amounts depending on wave exposure. Due to (micro)habitat variability in these areas, estimating the contribution of diatom communities to carbon fixation is challenging.

During an extensive sampling campaign in the 1990s, the abundance and diversity of epilithic and epiphytic diatoms were documented and quantified. The current study analyzes sediment diatom communities from the same sampling events as those earlier studies. These communities include epipsammic diatoms attached to sediment grains, epipelic diatoms that move freely within the sediment environment, and epilithic and epiphytic diatoms washed off their original rocky and macrophyte substrates.

This study highlights the diversity and variation of diatoms in cold-temperate shallow coastal systems. Preliminary results show a sediment diatom diversity averaging about 50 species per sampling site, with communities mainly consisting of small-sized diatoms (<1000 µm³), including typical epipsammic species such as *Planothidium delicatulum* and *Cocconeis scutellum*, as well as small epipelic species like *Navicula perminuta* and *Amphora* spp. Nearly all larger diatoms (>1000 µm³) were typical epipelic species such as *Nitzschia* spp. and *Epithemia* spp. (e.g. *Epithemia turgida var. westermannii*). In terms of biovolume, there is a wide range from small *Navicula margaritiana*, *Cocconeis*

hauniensis, *C. neothumensis*, and *Fallacia* clepsidroides (<50 µm³) to large *Campylodiscus* (~200,000 µm³). This three-order size difference between epipsammic and epipelic taxa is balanced by higher abundance and diversity in the epipsammic taxa, which are influenced by environmental factors such as wave exposure, nutrient levels, and salinity.

P6 – Marine Ecology

THE BURDEN OF MULTIPLE STRESSORS; HOW MICROPHYTOBENTHIC DIATOM COMMUNITIES RESPOND TO INCREASING NUMBERS OF POLLUTANTS

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The interactions between multiple stressors have long been suspected to have an important role in shaping ecosystem outcomes. However, traditional multiple stressor experiments are often limited in their scope due to logistical constraints of increasing the numbers of stressors. Rillig et al. (2019) used a novel approach to examine multiple stressors in terrestrial soils using an approach based on biodiversity research. They observed that the increasing number of stressors (the overall stress) explained a significant portion of the changes observed, and single stressor treatments had very little predictive power. The goal of our study has been to determine whether the same principles apply to the diverse and functionally important microphytobenthic (MPB) diatom communities present in intertidal mudflats. Using an intertidal mesocosm experimental setup with a 104 individual replicates, we observed the responses of MPB communities to 1, 2, 4, 6, 8 and 10 stressors. Each replicate within each treatment was randomly assigned a unique set of the relevant number of stressors selected from a library of 13 pollutants. This library was composed of 3 herbicides, 3 nutrients, 3 heavy metals, and 3 polycyclic aromatic hydrocarbons (PAHs), as well as TiO_2 nanoparticles. The responses to the stressors were measured through photo-physiology, biomass (Chl*a*), colloidal carbohydrate, and community changes. The results of this research should help inform whether environmental protection measures should target specific key stressors or whether the overall stress levels should be targeted. In this case, the experiments could be a stepping stone in applying this methodology further in other systems. Additionally, further analysis could prove useful in identifying any key stressors with interactive effects in a more efficient way by employing machine learning algorithms.

P7 – Paleolimnology

EARLY HOLOCENE DIATOM ASSEMBLAGES IN LITHUANIAN LAKES EXHIBIT REGIONALLY SYNCHRONOUS SHIFTS

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Three lakes were investigated using diatom analysis. The study sites include Lake Amalvas (southwestern Lithuania), Lake Dūkštelis (southeastern Lithuania), and Lake Avinėlis (eastern Lithuania). Sediment cores from all lakes consist predominantly of organic-rich sediments. The sediment chronology was established using radiocarbon dating.

The appearance of diatoms differs among the lakes: 14100 cal BP in Lake Avinėlis, 11800 cal BP in Lake Dūkštelis, and 10100 cal BP in Lake Amalvas. These differences reflect the asynchronous formation of the lakes following deglaciation and the establishment of suitable lacustrine environments for diatom development.

Late Glacial sediments were identified only in Lake Avinėlis (14100–11700 cal BP). These are dominated by benthic diatom taxa, including *Staurosira* sp., indicating shallow, oligotrophic to mesotrophic conditions.

Cluster and binary recursive segmentation (BIRESE) analyses show that the upper boundary of the Early Holocene is not synchronous but can be identified at approximately 8500 cal BP in all three lakes. Early Holocene assemblages are characterized by benthic and planktonic (*Lindavia* sp.) diatoms, reflecting increased water depth and oligotrophic–mesotrophic conditions.

Middle Holocene sediments (to ~7300 cal BP) show increased species diversity, including *Navicula* sp., *Cymbella* sp., *Tabellaria* sp., *Stephanodiscus* sp., along with a rise in planktonic *Aulacoseira* sp. These changes indicate rising lake levels and increasing eutrophication.

Based on Morisita-Horn similarity index comparisons of diatom palaeocommunities, BIRESE indicates pronounced boundaries at ca. 13600, 12000, 10400, 9400, and 8600 cal BP in Avinėlis; at ca. 11200, 10400, 9800, 9200, 8600, 8200 cal BP in Dūkštelis, and at ca. 9800, 8800, 8500, 8300, and 7500 cal BP in Amalvas. The recurrence of several boundaries (e.g. 10400, 9800, 8600–8500 and 8200–8300 cal BP) across multiple lakes suggests that these shifts reflect diatom palaeocommunity changes driven by larger-scale regional environmental processes, rather than local factors.

P8 – Paleolimnology

HOLOCENE DIATOM RECORDS OF ENVIRONMENTAL AND CLIMATE CHANGES IN THE HASSI MOUINA DEPRESSION (NW GREAT WESTERN ERG, ALGERIA)

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This study evaluates changes in the environmental conditions in the northern Algerian Sahara during the Early and Middle Holocene, based on diatom analyses extracted from the sediment of two outcrops obtained from the Hassi Mouina depression.

Diatom taxa were abundant to rare and poorly to well-preserved throughout the outcrops. A total of 67 species and varieties representing 19 genera were identified from the investigated 27 samples.

Two ecological groups have been distinguished based on habitat (epiphytic and epilithic taxa and planktonic forms). The most dominant littoral taxa (epiphytic and epilithic) are: *Amphora*, *Epithemia*, *Navicula*, *Mastogloia*, *Nitzschia*, *Cymbella*, Gomphonema, *Pinnularia* and *Diploneis,* while planktonic forms are represented only by *Cyclotella* and *Fragilaria*. On the other hand, *Epithemia* cf. *argus* Kützing was the most common species recorded at two sites. Most recorded diatoms preferring slightly alkaline to alkaline water occurred in the sediments, which is documented by the highest abundance of the alkaliphilous diatom group.

Based on the relative abundance of dominant and subdominant taxa and the cluster-constrained analysis, the investigated sections or outcrops are divided into several diatom zones, which revealed an evolution of changes in paleosalinity, pH, and water level of the Hassi Mouina paleolacustrine system.

Our results from the two outcrops generally show development of shallow-water conditions after 9000 14C BP (Phase 1 and Phase 2), with extensive littoral zones

and evaporative periods that coincide with a high concentration of salts and alkaline water. Higher water level was mainly recorded in certains samples, as indicated by the higher abundance of planktonic species (Cyclotella). Toward the upper part (Phase 3) of all sequences, after ~5300 14C BP, planktonic taxa

disappeared, species characteristic of brackish/alkaline water increased, diatom diversity decreased, and frustules were poorly preserved, indicating a drop in water level and dominance of dry conditions.

Conditions close to mesosaline are also registered in the two outcrops by the two abundant diatoms *Campylodiscus clypeus* and *Anomoeoneis sphaerophora*.

P9 – Paleolimnology

ENVIRONMENTAL CHANGE IN HOLOCENE LACUSTRINE DEPOSITS OF HASSI MANDA IN THE ERG ER RAOUI (ALGERIAN SAHARA DESERT) BASED ON DIATOM ANALYSIS

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Quantitative and qualitative diatom analyses from the Hassi Manda sediment in Algerian Sahara lakes were used to evaluate the environmental development of the lake and climate change during the late Holocene. 67 samples were analyzed, taken from three lakes on the border of Erg Er Raoui. A total of 49 diatom species and varieties were identified from one core obtained from the lake. The analysis based on calcareous diatomite collected from this outcrop allowed us to distinguish several ecological groups, reflecting variations in water salinity, lake levels, and trophic states. These changes are mainly associated with climatic variations during the Holocene. The diatom flora includes brackish and epiphytic species like *Epithemia argus*, along with some freshwater and planktonic species, primarily Stephanocyclus meneghinianus.

The results provide evidence of Holocene lacustrine conditions linked to the African Humid Period. Shallow-water conditions with wide littoral zones and evaporation periods quickly emerged during this time. High salt concentrations in warm, alkaline waters were linked to these conditions, suggesting marshy habitats.

As a result of generally drier circumstances, the climate also experienced brackish and alkaline conditions along with a drop in lake water levels.

P10 – Paleolimnology

DIATOM-BASED RECONSTRUCTION OF HYDROLOGICAL CHANGES IN PRE-HISPANIC CANAL-CAMELLÓN SYSTEMS OF THE MOMPOS DEPRESSION (COLOMBIA)

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The Mompos Depression (Colombia) constitutes one of the largest perennial wetland systems in the Neotropics. Pre-Hispanic societies profoundly transformed this flood-prone landscape through the construction of raised fields, habitation platforms, and extensive canal–causeway networks aimed at regulating water availability until ca. 800 yr BP, when the region was largely abandoned by Zenú populations. Despite their spatial scale and cultural significance, these archaeological hydraulic structures remain poorly explored from a paleoenvironmental perspective, particularly using aquatic bioindicators.

This study assesses the potential of diatom assemblages to reconstruct past hydrological and ecological conditions using sediment records from three collapsed archaeological canals (trench) abandoned at ca. 3000, 1400 and 700 yr BP. Trenches PALABT1_A24 and PALABT2_A24 locate close, whereas Trench PALABT3_A24 is farer, allowing evaluation of both local and regional hydrological dynamics. Diatom stratigraphy was analyzed alongside chrysophyte cysts, sponge spicules, and sedimentological and geochemical proxies.

Assemblages are dominated by benthic aerophilous taxa, particularly *Diadesmis confervacea*, indicating prolonged subaerial or marginally inundated conditions with low to moderate flow. These phases are intermittently punctuated by enhanced standing-water conditions, reflected by increased abundance and diversity of planktonic taxa, mainly *Aulacoseira spp*. Between ca. 2000 and 1000 yr BP, PALABT3_A24 shows stable dominance of *D. confervacea* (~40%) with increased *Aulacoseira italica*. From ca. 1000 to 400 yr BP, strong dominance of *D. confervacea* (up to 80%) and the disappearance of *A. italica* indicate prolonged aerial exposure. Comparable dynamics occur in PALABT2_A24 over the same time interval and continue to the present. The same pattern is observed in PALABT1_A24 until ca. 400 yr BP. After ca. 400 yr BP, PALABT1_A24 follows a divergent hydrological trajectory, characterized by increasing *Aulacoseira* species and declining *D. confervacea*, indicating more persistent standing-water conditions than those inferred for PALABT2_A24. Together, the records reveal common hydrological signals with site-specific divergence. Funding: ref. PID2022-138059NB-I00

P11 – Paleolimnology

SEASONAL DYNAMICS OF DIATOM ASSEMBLAGES IN SEDIMENT TRAPS AT CONTRASTING DEPTHS IN LAKE SANABRIA (NW SPAIN)

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Sediment traps provide a unique window into the temporal dynamics of diatom flux and the fidelity of the sedimentary record relative to planktonic and benthic communities. We analysed diatom assemblages in sediment traps deployed at 6 m and 40 m depth in Lake Sanabria — the largest natural lake in the Iberian Peninsula — over a 20-month period (February 2016 – October 2017), spanning a documented ecosystem regime shift driven by reduced precipitation and increased water residence time.

Assemblage composition differed markedly between depths and showed strong seasonal structuring. At 6 m, benthic taxa consistently dominated (50–72% of total valves), reflecting resuspension and lateral transport from littoral habitats, and remained relatively stable throughout the study period. At 40 m, the benthic fraction was substantially lower, and the assemblage was increasingly governed by planktonic taxa linked to stratification dynamics.

The most striking pattern was the explosive development of *Asterionella ralfsii* var. *americana* from autumn 2016 onwards, reaching >80% of total valves at 40 m during spring–summer 2017 — values far exceeding those recorded at 6 m. This depth-dependent signal indicates strong downward flux during bloom conditions and suggests that deep traps capture planktonic events with greater fidelity. *Aulacoseira* species (principally *A. valida*, *A. asimetriolata* sp nova, and *A. tenella*) dominated during non-bloom periods, with differential representation between depths reflecting their distinct life strategies and sinking rates.

These results highlight that depth-specific trap data are essential for interpreting paleolimnological diatom records in thermally stratified lakes, and that short-term bloom dynamics can disproportionately shape the subfossil signal preserved in sediments.

P12 – Freshwater Ecology

DIATOMS AS INDICATORS OF ENVIRONMENTAL CHANGES IN HIGH-ELEVATION STREAMS AND LAKES INFLUENCED BY ROCK GLACIERS

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Diatoms are key components of aquatic ecosystems and dominant primary producers in alpine ecosystems. Apart from their important ecological roles, diatoms are also used to indicate environmental conditions in streams and lakes. Studies of diatoms in the Swiss National Park are focused on the Macun area and conducted regularly since 2001. The drainage network of Macun consists of a north and south basin, including 26 small lakes and 10 temporary ponds. Water sources in the catchment originate from precipitation and seven rock glaciers connected to the south basin. Changes in diatom assemblages can reflect long-term changes in physico-chemistry of surface waters, for instance due to rock glacier melting. The pH of studied waters was ca. 6.5 and conductivity ranged from less than 10 µS/cm to 19 µS/cm. Nitrogen levels were about double (190 µg/L versus 80 µg/L) and particulate phosphorus about half (5.0 versus 9.5 µg/L) in the south basin relative to the north basin. Over the entire study, nearly 400 taxa were identified. The most abundant taxa were *Achnanthidium nanum*, *A. minutissimum*, *Gomphonema exilissimum*, *Odontidium mesodon*, *Psammothidium helveticum*, *P. subatomoides*, *Tabellaria flocculosa*, and *Aulacoseira alpigena*. Communities were dominated by small-sized species of the *Achnathidium* and *Psammothidium* genera, probably because of the extremely low conductivity and nutrient levels. There were also significant differences in diatom communities between the north and south basin. In lakes, the number of planktonic taxa was distinctly lower in the southern basin, influenced by the glacier. Changes in diatoms over the 25-year study period mirrored the changes in physico-chemistry, suggesting a tipping point in the surface waters of Macun that occurred around the year 2010. The decreasing influence of rock glaciers in the catchment results in loss of physico-chemical niches in the Macun basin which may cause reductions in basin-scale diatom diversity, as suggested in this study.

P13 – Freshwater Ecology

HOW DO DIATOMS ADAPT TO WARMER CLIMATES? INVESTIGATING THERMAL NICHE SHIFTS AND THE ROLE OF GENE EXPRESSION EVOLUTION.

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Climate change is one of the most pressing issues of our time and will impact organisms all over the world. Understanding how ecosystem engineers, such as diatoms, will respond to changes in their environment, such as temperature, is essential to build accurate predictions on the long-term impacts of climate warming on ecosystems worldwide. Here, we leverage two diatom radiations with a known history of cross-climate colonisations, namely the terrestrial *Pinnularia borealis* species complex and the marine, tychoplanktonic *Cylindrotheca closterium* species complex, to unravel diatom responses to changes in temperature.

First, we will characterise and compare inter- and intraspecific variation in thermal niches across species inhabiting contrasting climate zones. To achieve this, we are currently generating temperature growth curves under common garden conditions. Second, we will investigate the mechanisms underlying thermal adaptation in diatoms by assessing the role of gene expression in the evolution of thermal niches. Transcriptomic data will be obtained from the experimental strains at their thermal optima and gene expression will be modelled as an evolving trait in a phylogenetic framework.

Together, these analyses will allow us to not only discover to what extent gene expression drives thermal niche evolution in diatoms, but also whether the evolutionary history of individual species (e.g., long term presence in a given climate zone versus recent cross-climate colonisations) affects adaptive potential. This poster presents preliminary data on the characterisation of diatom thermal niches across climate zones, forming the foundation of future integrative eco-evolutionary analyses.

ASSESSING WATER QUALITY IN MEDITERRANEAN WETLANDS THROUGH DIATOM ASSEMBLAGES

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Wetlands are crucial yet vulnerable ecosystems highly sensitive to anthropogenic pressures. In alignment with the European Water Framework Directive, this study evaluates the environmental quality of five wetland sites in the Subbética region using benthic diatoms as bioindicators. Diatom samples were collected by scraping rocky substrates across five stations (Polje de la Nava, Las Chorreras, Fuente de la Alberca Robles, Río San Juan, and Río Jandulilla) and fixed in 4% formaldehyde. Taxonomic identification allowed the calculation of the Specific Pollution Sensitivity Index (IPS). Concurrently, physical-chemical parameters—including temperature, dissolved oxygen, and nutrients—were analyzed to validate the biological indices.

A total of 63 diatom species were identified. The results demonstrate that diatom assemblages are effective indicators of ecological status in these aquatic systems. Interestingly, the highest water quality was recorded at Fuente de la Alberca Robles (IPS 16.5), an area with null organic pollution and eutrophication, despite hosting the lowest species richness (15 species). In contrast, the Las Chorreras site exhibited the lowest quality index. This degraded site, despite hosting 21 species, was dominated by low-sensitivity taxa such as *Nitzschia capitellata* (23.31%) and *Gomphonema parvulum* (13.29%), which correlated with higher phosphate levels and runoff. Furthermore, agricultural pressures, particularly from olive groves, increased eutrophication in sites like Río Jandulilla.

The findings indicate that nutrient availability and dissolved oxygen significantly shape diatom distribution. Crucially, greater diatom diversity did not strictly equate to better water quality; the presence of sensitive species was the defining factor. This research reinforces the utility of diatom-based indices for biomonitoring Mediterranean mountain wetlands.

P15 – Freshwater Ecology

DECIPHERING THE SPATIO-TEMPORAL EXPANSION OF NON-INDIGENOUS DIATOM SPECIES IN MAJOR IBERIAN RIVER BASINS (2001–2024)

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Non-indigenous species are among the primary threats to global ecosystem integrity, jeopardizing freshwater biodiversity and potentially compromising the reliability of bioindication metrics within the Water Framework Directive (WFD). While invasions by fish, macrophytes, and macroinvertebrates are well-documented, the dynamics of non-indigenous diatom species in the Iberian Peninsula remain poorly understood. This study leverages an extensive dataset (2001-2024) from the Spanish Ministry for Ecological Transition and the Demographic Challenge (MITECO), focusing on the four river basin districts with the highest data density: Ebro, Duero, Guadalquivir, and Segura.

By targeting taxa identified as non-indigenous (NIS) or invasive (IAS) species according to the EXOCAT database, we analyzed their occurrence following their initial detection in the peninsula circa 2006. Preliminary results indicate that: (i) NIS/IAS expansion is non-uniform, with the Ebro and Duero basins exhibiting the highest vulnerability and detection density; (ii) a generalized increase in detections has occurred since 2010–2015, likely reflecting both biological expansion and intensified monitoring efforts; and (iii) current evidence does not consistently support a decline in community diversity associated with invasive taxa at the local scale, although basin-specific patterns suggest context-dependent responses.

Our approach ensures taxonomic consistency across more than two decades of biomonitoring. As core objectives of an upcoming research project, we aim to: (i) define the ecological preferences of these NIS/IAS species; (ii) evaluate whether their presence introduces systematic bias in WFD-standardized indices, such as the IPS; and (iii) determine whether these species act as sentinels of anthropogenic disturbance or signify a permanent ecological shift. These findings will provide critical insights into the resilience of Mediterranean and Atlantic fluvial ecosystems against the "silent invasion" of microscopic primary producers.

P16 – Freshwater Ecology

DIATOM COMMUNITY STRUCTURE AND BIOINDICATOR SIGNIFICANCE IN THE SOUTHERN MEDITERRANEAN SEMI-ARID REGION: CHELIFF RESERVOIR (NORTHWEST ALGERIA)

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Diatoms are key components of freshwater phytoplankton and reliable indicators of ecological status in reservoirs. This study investigated the taxonomic composition, seasonal dynamics, and bioindicator value of diatom assemblages in Cheliff reservoir (Northwest Algeria), a shallow eutrophic water body subjected to strong hydrological variability. Phytoplankton samples were collected monthly over a two-year period (November 2020–October 2022) at four sampling stations selected to capture spatial heterogeneity. A total of 131 phytoplankton taxa were identified, with Chlorophyceae representing the richest group (45 species), followed by Diatomophyceae (37 species), Cyanophyceae (29 species), and Euglenophyceae and Zygnematophyceae (11 species each). Dinophyceae, Chrysophyceae, and Cryptophyceae showed comparatively low diversity. Diatoms ranked second in species richness and were particularly abundant during winter and spring. Centric diatoms dominated the assemblage, with *Stephanocyclus meneghinianus* as the leading taxon (D = 23.7%), followed by *Cyclotella atomus*, *Stephanodiscus neoastraea*, *Pantocsekiella ocellata*, and *Discostella stelligera*. These species are commonly associated with eutrophic, alkaline, and nutrient-enriched waters. Pennate diatoms were also well represented, especially the genus *Nitzschia*, with *Nitzschia palea* and *Nitzschia acicularis* among the most frequent taxa, indicating tolerance to organic enrichment and disturbed conditions. Several benthic and epiphytic species, including *Achnanthidium catenatum*, *Cocconeis placentula*, *Gomphonema parvulum*, and *Surirella ovalis*, were characteristic of upstream stations influenced by river inflow and riparian vegetation. Diatom assemblages proved to be effective indicators of spatial and seasonal ecological gradients, supporting their use in reservoir biomonitoring and water-quality assessment in Mediterranean semi-arid regions.

P17 – Freshwater Ecology

MICROHABITAT FILTERING STRUCTURES DIATOM COMMUNITY ASSEMBLY IN COEUR D'ALENE LAKE, IDAHO, USA

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Understanding the mechanisms structuring microbial communities in heterogeneous freshwater systems remains a central challenge in aquatic ecology. In large lakes, diatom assemblages may be influenced by microhabitat conditions, basin-scale gradients, and spatial processes, yet the relative importance of these factors remains unresolved. This study investigates community assembly in Coeur d'Alene Lake (Idaho, USA), a spatially complex, mining-impacted system. Diatom assemblages were analyzed from 57 samples collected across five habitat types representing pelagic and benthic environments distributed among three lake basins. Community composition, diversity structure, functional guilds, and diatom-based indices were evaluated using multivariate statistics, beta-diversity approaches and constrained ordination approaches. Assemblages differed significantly among habitats and basins (PERMANOVA, $F_{6,50}$ = 76.49, R^2 = 0.902, p = 0.001), with clear separation between planktonic and benthic communities. Multivariate dispersion also varied among habitats (PERMDISP, $F_{4,52}$ = 6.14, p = 0.001), and NMDS provided an excellent fit (stress < 0.001), confirming strong habitat clustering. Alpha diversity differed significantly among habitats (Kruskal–Wallis, H = 49.3–50.2, p < 0.001; η^2 = 0.871–0.888), with lower diversity in planktonic assemblages. Temperature showed the strongest association with diversity patterns (ρ = 0.529–0.602, p < 0.001), while other variables were not significant. Diatom-based indices varied across habitats, with higher trophic values in sediment-associated environments and lower values in planktonic assemblages, indicating overall mesotrophic conditions. Null model results indicated significant deviation from random assembly. These findings demonstrate that diatom communities follow a hierarchical assembly pattern dominated by microhabitat filtering. The results highlight the importance of habitat-specific sampling for improving the ecological interpretation of diatom-based biomonitoring in heterogeneous lake systems.

P18 – Freshwater Ecology

DIATOM COMMUNITY STRUCTURE ALONG PHYSICOCHEMICAL GRADIENTS IN SILICEOUS ATLANTIC RIVERS: INSIGHTS FROM THE MERO BASIN (A CORUÑA, GALICIA, NW IBERIAN PENINSULA)

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The Mero and Barcés Rivers are a key source of drinking water for the city of A Coruña (NW Spain), making it essential to understand the ecological processes and anthropogenic pressures shaping their biological communities. This study analysed the beta diversity (Bray-Curtis) of diatom communities along environmental gradients in two Cantabrian-Atlantic siliceous streams (R-T31 typology) subjected to contrasting anthropogenic pressures, aiming to provide insights into local community assembly processes.

We sampled five stations in each river, analysing physicochemical parameters and diatom community composition. Environmental trends were explored using linear regressions against relative distance from headwaters and principal component analysis (PCA). Community composition was assessed using PERMANOVA, abundance heatmaps, local contribution to beta diversity (LCBD), and distance-based redundancy analysis (dbRDA). Taxonomic beta diversity was partitioned into turnover and nestedness.

Both rivers exhibited a common longitudinal gradient, characterised by increasing nitrate concentrations and decreasing dissolved oxygen. The Barcés showed significantly higher concentrations of sulphates, reflecting greater water mineralisation associated with discharges from the Meirama artificial lake. The Mero displayed a progressive nutrient enrichment consistent with diffuse agricultural pressures.

The abundance heatmap revealed a clear differentiation between headwater stations of both rivers and higher compositional cohesion among downstream reaches. The dbRDA showed that nitrate, sulphate, and dissolved organic carbon explained 49.6% of the variation in diatom community composition, separating headwater stations and clustering downstream reaches of both rivers in the ordination space. The LCBD decreased significantly along the longitudinal gradient, indicating that headwaters function as areas of high compositional uniqueness. However, this pattern does not imply loss of species richness, as beta diversity is dominated by species turnover.

Overall, these results suggest that diatom communities in the studied reaches are primarily structured by longitudinal environmental filtering, conditioned by contrasting anthropogenic pressures at the catchment scale.

P19 – Saline Habitat Taxonomy

CONTRIBUTION TO THE DIVERSITY OF TAXONOMICALLY PROBLEMATIC SMALL FRAGILARIOID DIATOMS FROM A THERMOMINERAL SPRING IN SERBIA

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Thermomineral springs are specific habitats characterized by stable physicochemical conditions and often host distinct and insufficiently explored diatom communities. During an investigation of benthic diatoms associated with phototrophic microbial mats in a natural thermomineral spring with a predominantly sedimentary substrate at Vrujci (central Serbia), two taxa belonging to the genera Staurosira and Staurosirella were recorded. The investigated spring is characterised by neutral to slightly alkaline water (pH 7.45), low turbidity (0.04 NTU), and moderate electrical conductivity (461 µS/cm at 20 °C). Nutrient concentrations and concentrations of ammonium and nitrite were generally low, indicating oligotrophic to mesotrophic conditions.

The first taxon shows a strong morphological resemblance to Staurosira venter (Ehrenberg) Cleve & Möller. Morphological observations based on light microscopy (LM) and scanning electron microscopy (SEM) revealed valves measuring 6–8 µm in valve length and 3.0–3.7 µm in valve width, with a stria density of 11–12 in 10 µm. These features distinguish the examined taxon from the typical concept of S. venter, which is generally reported to have a higher stria density (13–16 in 10 µm). Moreover, the concept of S. venter is currently under taxonomic revision. The second taxon shows a morphological resemblance to Staurosirella canariensis, sharing the characteristic valve outline and some structural features (uniseriate striae, two or three apically oriented lineolae on the valve face, number of marginal spines) observed in SEM. The examined specimens measure 7–8 µm in valve length in contrast to S. canariensis with valves 4–7 µm in length based on literature. Valve width ranges 3.0–3.5 µm, which falls within the size range reported for S. canariensis.

These findings contribute to the current knowledge of the diversity and morphological variability of small fragilarioid diatoms and highlight the importance of detailed morphological investigations for resolving taxonomic complexity within these groups.

P20 – Saline Habitat Taxonomy

DIATOMA SPECIES FROM SALINE HABITATS (VOJVODINA REGION, SERBIA)

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The genus *Diatoma*, Bory (1824), comprises a relatively small number of species characterised by distinct morphological features, including silicified transapical ribs, a raised central sternum, and fine striae composed of small round areolae. Although predominantly freshwater and commonly occurring in planktonic and benthic habitats as chain-forming colonies, *Diatoma* species have also been recorded in brackish and saline environments. Some taxa exhibit tolerance to elevated nutrient levels, highlighting their potential as indicators of eutrophication.

Diatom and water samples for analysis were collected in spring 2023 from three saline habitats in the Vojvodina Region, Serbia: the artificial sandpit lake "Peskara", the shallow saline natural lake Pečena Slatina, and the saline channel Slatina. According to physicochemical parameters, all three localities have pH values above 8 and are hyposaline or subsaline.

One of the dominant taxa in the artificial sandpit lake "Peskara" (51.06%) was a *Diatoma* species that has unique morphological characters different from known species: linear valves with almost parallel margins in larger specimens, linear to linear-elliptic in smaller specimens, broadly rounded and not protracted ends, and distantly positioned primary ribs, clearly distinguishing this taxon from other known *Diatoma* species, such as *D. elongata*, *D. tenuis*, *D. problematica*, and *D. moniliformis*.

The poster illustrates *Diatoma* taxa from saline habitats in the Vojvodina Region and other comparable *Diatoma* species.

P21 – Saline Habitat Taxonomy

IN SEARCH FOR THE IDENTITY OF HALAMPHORA KOLBEI (ALEEM) ÁLVAREZ-BLANCO & S.BLANCO: ANALYSIS OF THE TYPE MATERIAL OF AMPHORA INCRASSATA GIFFEN AND COMPARISONS WITH POPULATIONS OF H. KOLBEI – GROUP

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During the 20th century, two small-celled taxa characterised by bi-undulated dorsal margins and delicate striae were described within the genus Amphora Ehrenberg ex Kützing. Both taxa were separated from A. bigibba Gunow and its related taxa because of their smaller valve size and/or finer striation. The first taxon, *Amphora kolbei* Aleem (non *A. kolbei* Skvortzov), was discovered on the Mediterranean coasts of Egypt and subsequently has been reported mostly from the Mediterranean Sea. After the establishment of the genus *Halamphora* (Cleve) Levkov, it was transferred to this genus as *H. kolbei* (Aleem) Álvarez-Blanco & S.Blanco. The second taxon, Amphora incrassata Giffen, is a rarely documented species. Originally, it has been recorded from both the Seychelles and South Africa, with its type originating from the Seychelles. Since H. kolbei and *A. incrassata* share similar morphological features, we attempted to retrieve their type material for re-examination. Unfortunately, we could not find any material of Aleem's *Amphora* (*Halamphora*) *kolbei*, but at least material of *A. incrassata* was available. Following light and scanning electron microscope analyses, two different taxa were found in the type material of A. incrassata. One of the taxa could be assigned to *A. incrassata*, but the second taxon corresponded to neither *A. incrassata* nor *H. kolbei*. Further analyses of populations identified as *H. kolbei* from the Mediterranean Sea, the Black Sea, and Indonesia, showed that there is subtle morphological variation among geographically distinct populations, as well as in comparison with A. incrassata. The poster illustrates *A. incrassata* and discusses the observed variability in *H. kolbei*, with comparisons to *A. bigibba* – group and comments on the generic status of the taxa.

P22 – Saline Habitat Taxonomy

A NEW HALAMPHORA TAXON FROM HAILUOTO ISLAND, FINLAND

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One of the first floristic works devoted to diatoms of the Baltic Sea was H. Juhlin-Dannfelt (1882), entitled "On the diatoms of the Baltic Sea". To date, studies on diatoms in the Baltic region have been irregular across time and countries In Finland's Baltic Sea areas (Gulf of Finland and Gulf of Bothnia) - the primary sources documenting the diatom flora have been summarized in important scientific works. Among the most significant works, "Die Diatomeen von Schweden und Finnland" by Cleve-Euler (1952–1955) is one of the core sources for this region. A significant contribution was also made through a series of monographic publications "Intercalibration and distribution of diatom species in the Baltic Sea" edited by Snoeijs et al. (Snoeijs, P. (ed.) 1993; Snoeijs, P. & Vilbaste, S. (eds) 1994, Snoeijs, P. & Potapova, M. (eds), 1995, Snoeijs, P. & Kasperoviciene, J. (eds), 1996., Snoeijs, P. & Balashova, N. (eds) 1998), which summarized data on the distribution and identification of diatom species in the Baltic Sea. Additional materials from the Baltic region were taken into account in other authoritative publications including "Süßwasserflora von Mitteleuropa" and the well-known Iconographia Diatomologica Vol. 7: Diatom Flora of Marine Coasts by Witkowski et al. (2000), The Checklist of Baltic Sea phytoplankton (2004). At that time Siira, Olli-Pekka (2017) was noticed *Halamphora eunotia* (Cleve) Levkov, *H. exigua* (Gregory) Levkov, *H. holsatica* (Hustedt) Levkov, *H. thumensis* (A.Mayer) Levkov, *H. terroris* (Ehrenb.) P.Wang, *H. turgida* (Gregory) Levkov and *H. veneta* (Kützing).

This study introduces a new *Halamphora* taxon in the Finnish Baltic Sea. The taxon has semi-lanceolate valves, dorsiventral with strongly arched dorsal margin and weakly tumid ventral margin. Valve ends shortly protracted, capitate and slightly ventrally bent. Dorsal striae subparallel to slightly radiate throughout and biseriate, composed of irregular small, rounded areolae. Ventral striae uniseriate composed of rounded areolae and interrupted in the region of central nodule.

P23 – Saline Habitat Taxonomy

DIVERSITY OF MARINE BENTHIC DIATOMS ON MACROPHYTES IN COASTAL WATERS PRONE TO BLOOMS OF THE TOXIC DINOFLAGELLATE OSTREOPSIS

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Marine benthic diatoms associated with macrophytes are an important but insufficiently explored component of coastal ecosystems, which are particularly relevant in areas affected by harmful algal blooms. In the framework of the ECOS project, we investigated the taxonomic diversity (via LM and SEM) of epiphytic diatoms and their relationship with *Ostreopsis* sp. blooms at the locality of Llavaneres (NW Mediterranean, Catalan coast) and two sites at the island of El Hierro (Canary Islands, Central East Atlantic). Starting on February 2024, samplings were conducted monthly for two years (2024-2026) in Llavaneres (with fortnightly sampling in summer) and for 18 months (2024-2025) in El Hierro.

Here we present an overview of the taxonomic component of the study that reveal both biogeographic and floristic similarities and differences between the sites. In total, 362 taxa representing 107 genera were identified. Llavaneres yielded 203 taxa from 83 genera, whereas El Hierro yielded 296 taxa from 93 genera. Site-specific diversity was pronounced: 66 taxa (18% of the total flora) representing 41 genera occurred exclusively in Llavaneres, while 159 taxa (44%) representing 57 genera were recorded only in El Hierro. However, a considerable proportion of the material could not be assigned confidently to described species. Overall, 90 taxa (25%) were identified as "sp." and 49 taxa (14%) as "cf." Taxonomic uncertainty, with taxa difficult or impossible to identify to species level, was particularly evident on El Hierro and higher than in Llavaneres, Overall, El Hierro exhibited greater diatom species richness.

Considering the identified taxa, the recorded assemblages were typical of warm-water marine benthic habitats and included numerous cosmopolitan taxa, such as *Cocconeis scutellum*. Zonal taxa include several species of *Mastogloia* and *Diploneis*. Furthermore, some taxa exhibited a more restrict distribution, such as some *Pteroncola* and *Gomphonemopsis* species found in one of the sites only.

P24 – Freshwater Taxonomy

NOTEWORTHY AND POTENTIALLY NEW ADLAFIA SPECIES FROM CROATIA AND NORTH MACEDONIA

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Adlafia Lange-Bertalot is a relatively small diatom genus currently comprising approximately 33 species, as listed in AlgaeBase. Species within this genus are typically freshwater, characterized by small cells with linear to linear-lanceolate outlines and rostrate, subcapitate, or wedge-shaped apices. Although widely distributed, many *Adlafia* species are considered pseudoaerial and are commonly associated with alkaline, oligotrophic headwater streams.

In this study, several noteworthy *Adlafia* taxa were recorded from mountainous regions in North Macedonia, as well as from the Plitvice Lakes National Park, a karstic environment in Croatia. The taxa identified from the Shar Planina mountain range include *Adlafia brockmannii* (Hustedt) Bruder & Hinz, *A. detenta* (Hustedt) Heudre, C.E. Wetzel & Ector, and *A. sinensis* Bing Liu & D.M. Williams, along with one potentially new species, *Adlafia* sp.2. Additionally, two other potentially new taxa were observed: *Adlafia* sp. from the Plitvice Lakes, Croatia and *Adlafia* sp.1 from a mountain reservoir in North Macedonia. Notably, a population morphologically similar to *A. brockmannii* was recorded in a thermo-mineral stream. This finding suggests a broader ecological amplitude for this taxon than previously recognized, extending its habitat beyond strictly oligotrophic, clean, and well-oxygenated environments.

These records contribute to a better understanding of the diversity, distribution, and ecological variability of the genus *Adlafia*, highlighting the potential for undiscovered taxa in understudied mountain and karstic ecosystems.

THE STAUROSIRA VENTER ENIGMA FINALLY REVEALED? EVIDENCE FROM HISTORIC MATERIAL

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Staurosira venter is one of the most reported small-celled araphid diatoms worldwide, reported from nearly every continent, often present in large quantities. Analysis of published illustrations reveals a large morphological variability in both size, shape and structure, indicating the likely presence of multiple taxa under the same name. A study of the original Ehrenberg material from Germany, not only enabled a better definition of the taxon bearing the name *S. venter*, but also made clear that the different populations now identified as venter needed a thorough revision.

Based on a detailed study of historic materials, original drawings from the nineteenth century, and modern populations, several (new) taxa can be separated, showing not only a distinct morphology but also specific environmental preferences.

The poster illustrates the different taxa based on light and scanning electron microscopy observations and discusses the similarities and differences between the taxa highlighting the discriminating features.

P26 – Freshwater Taxonomy

DIATOM FLORA IN A CHANNEL FED BY LAKE BIWA ON THE CAMPUS OF THE UNIVERSITY OF SHIGA PREFECTURE, JAPAN

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We conducted a survey of diatom flora in a watercourse located on the campus of the University of Shiga Prefecture (Hikone, Shiga, Japan). This watercourse receives water from Lake Biwa via fish farming ponds operated by the Shiga Prefectural Fishery Experiment Station. This watercourse had been used for field coursework or research activities. Although planktonic and fossil diatoms in Lake Biwa are relatively well documented, benthic diatoms in the littoral zone of the lake remain poorly understood. Recent studies have reported potentially invasive periphytic diatoms in rivers and lagoons within the Lake Biwa watershed, suggesting significant changes in the periphytic diatom flora in recent decades.

Diatom samples were collected from 10 sites in the watercourse between 2022 and 2023. Samples were cleaned using either alkaline digestion (NaOH) or acid digestion (HCl, H_2SO_4, and H_2O_2) to remove organic material. All frustules on the preparation were examined under a light microscope at 1000x magnification and identified to species level. Frustule ultrastructure was observed using scanning electron microscopes. In total, 174 species were recorded, representing 62 genera, including 19 unidentified taxa. The most species-rich genus was *Gomphonema*, followed by *Nitzschia* and *Navicula*. More than a dozen taxa formerly classified within the genus *Fragilaria*, including *Nanofrustulum*, *Pseudostaurosira*, *Punctastriata*, and *Staurosira* were observed.

The diatom taxa recorded in this study have commonly been reported from the littoral zone of Lake Biwa; however, some may represent species complexes requiring further taxonomic resolution. Additionally, several potentially introduced species were detected, indicating possible anthropogenic introductions.

These findings highlight the importance of continuous taxonomic monitoring of benthic diatom communities for detecting ecological changes and biological invasions in freshwater ecosystems.

P27 – Freshwater Taxonomy

EXTREMOPHILIC NITZSCHIA SPECIES IN A MAN-MADE ENVIRONMENT: PHYLOGENETIC LINK TO CRIMEAN VOLCANIC ISOLATE

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This study documents the occurrence of extremophilic *Nitzschia* aff. *anatoliensis* population inhabiting a highly unusual, man-made microhabitat in southern Poland (Poręba Wielka, buffer zone of Gorczański National Park). The species was found in a hypersaline seepage emerging from a remnant borehole pipe associated with historical geothermal exploration. The habitat is characterized by extremely limited water availability (a thin film of a few millimeters), high salinity, exposure to a metal substrate, and strong temperature fluctuations.

Morphological analyses based on light microscopy and scanning electron microscopy revealed striking similarity to the widespread *N. communis*. However, molecular data (*rbc*L) demonstrated that the studied population is only distantly related to this taxon. Instead, it shows a close phylogenetic affinity to *N.* cf. *thermaloides* isolated from Crimean mud volcanoes, and a related position to *N. anatoliensis* described from Turkey.

Despite this phylogenetic proximity, *N. anatoliensis* exhibits morphological differences compared to both the Polish and Crimean populations, suggesting unresolved taxonomic relationships within this group. Further integrative studies will be necessary to clarify species boundaries and confirm the taxonomic status of these taxa.

Our findings highlight that even extremely small and transient anthropogenic habitats can support stable populations of extremophilic diatoms, including unrecorded taxa.

ODONTIDIUM OR DIATOMA – THAT IS THE BASIC QUESTION, AN INTEGRATIVE APPROACH TO MORPHOLOGICAL AND MOLECULAR DATA

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Recent advances in research on diatom diversity highlight the limitations of "classical" taxonomy based on morphological features, particularly among morphologically similar species. Consequently, the importance of molecular studies is increasing, as they enable precise phylogenetic analysis and the detection of cryptic species. The aim of this study was to obtain marker gene sequences for diatoms of the genera *Odontidium* and *Diatoma* from mountain springs to compare morphological and molecular data.

Environmental material for the study was collected from springs in the Western Bieszczady Mountains, after which single cells were isolated for cultivation. The analysis involved comparing morphological features of selected species from environmental samples and cultured material, as well as comparing rbcL marker sequences. The obtained sequences were compared with reference dataset and interprets in the context of light and scanning electron microscopy observations.

The obtained results represent some of the first molecular data within the studied genera. The integration of morphological and molecular analyses highlights the importance of combining genetic and morphological approaches. These findings provide a basis for further analyses and taxonomic revision of diatoms of the genera *Odontidium* and *Diatoma*.

P29 – Freshwater Taxonomy

A STUDY OF AMPHORA BIGIBBA GRUNOW - SPECIES COMPLEX: THE IDENTITY OF AMPHORA BINODIS GREGORY

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Amphora binodis W.Gregory was described nearly two centuries ago from Lamlash Bay (Isle of Arran, Scotland, UK). The species is nowadays only rarely reported, most likely because of its poorly understood identity and historical confusion with similar taxa. With features such as having bi-undulated dorsal margins, strongly elongated linear apices and a rectangular central area on the dorsal side, it closely resembles *Amphora binodis* var. *interrupta* Grunow, a taxon described from Central America, shortly after *A. binodis*. *Amphora binodis* var. *interrupta* [as *A. bigibba* var. *interrupta* (Grunow) Cleve] is since long considered as a variety of *Amphora bigibba* Grunow. The latter is another species possessing bi-undulated dorsal margins, described in the 19th century from Indonesia.

Literature analysis revealed a complex and entangled taxonomic history of these taxa, which contributed to confusion and uncertainty with regard to their identities. To clarify the identity of *A. binodis*, we undertook a detailed analysis of several historic slides containing material from the type locality of *A. binodis*, alongside the original description and drawing of the species. Following observations of similar valves on historic and contemporary slides with material originating from other localities, we discovered morphological variability between the valves possessing features of *A. binodis*. A similar observation was made following a revision of recently published illustrated valves from geographically distinct populations. The differences suggest the presence of several, most likely distinct taxa.

The poster illustrates *Amphora binodis* and comments on the different populations observed in our study. The generic position of the species is also discussed.

P30 – Freshwater Taxonomy

A NEW TAXON FROM EL MACTA MARHS IN ALGERIA

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The El Macta marsh is a coastal wetland parallel to the Mediterranean Sea (Gulf of Arzew), located in northwestern Algeria, in the downstream part of the El Macta watershed, 40 km west of the Mostaganem province and 50 km east of the Oran province. It is a triangular marshy depression, separated from the Gulf of Arzew by a coastal dune barrier. This marshy depression naturally extends the Sig and Habra plains, where the Sig, Habra, and Tinn wadis converge to form the Macta wadi, which flows into the Mediterranean Sea near Mers El Hadjadj. This area is considered a transition zone between freshwater and seawater, forming a favorable environment for the development of diatoms, which are organism's sensitive to changes in the physico-chemical parameters of the environment. The samples were collected from epilithic substrata in August-2024. This study introduces a new *Halamphora* taxon in the estuarine.

P31 – Freshwater Taxonomy

MORPHOLOGICAL CHARACTERISATION OF AN AULACOSEIRA SPECIES (AULACOSEIRACEAE) FROM A SOFT-WATER LAKE IN NORTHWESTERN SPAIN

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This study analyses the morphology of a species of the centric genus *Aulacoseira* Thwaites (Aulacoseiraceae) from Lake Sanabria (1000 m a.s.l.), a warm-monomictic lake of glacial origin in northwest Spain. The taxon is common in this lake, and it has been the dominant planktonic diatom during certain periods, but its identity remains unresolved.

The taxon was examined using light microscopy (LM) and scanning electron microscopy (SEM), and its differences from other species in the genus are discussed.

Frustules are cylindrical and form short filaments (mostly consisting of two cells) linked by simple, relatively robust marginal spines. LM observations (n = 96) show a cell diameter of approximately 8–10 µm and a cell length of ~7–11 µm. Pervalvar striae (18–21 in 10 µm) are slightly inclined (dextrorse) and curved, with about 21–26 areolae in 10 µm (SEM observations). The valve face is flat and covered by areolae over most of its surface, occasionally lacking areolae at the centre. Each spine bears two pervalvar ribs at its base, and a conspicuous pseudoseptum (up to ~2 µm wide) is clearly visible under both SEM and LM.

The species is compared with several morphologically similar taxa (*A. subborealis, A. subarctica, A. alpigena, A. laevissima, A. nygaardii, A. distans* and *A. pusilla*). In particular, it differs from *A. pusilla* in having a larger diameter and a wider pseudoseptum, and from *A. subborealis* in its lower stria and areolar densities. Based on these morphological differences, we hypothesise that the Lake Sanabria *Aulacoseira* may represent a new species.

Lake Sanabria is an oligotrophic, slightly acidic system (pH ~6.4) with very low conductivity (~12.7 µS cm^{-1}), typical of lakes situated on siliceous bedrock. Further research is required to determine whether this *Aulacoseira* also occurs in other mountain lakes in the region with similar conditions.

P32 – Freshwater Taxonomy

FIRST RECORD OF A CENTRIC DIATOM PANTOSCEKIELLA IN THE HOLOCENE LACUSTRINE DEPOSITS OF THE GREAT WESTERN ERG (SAHARA, ALGERIA).

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The study of diatoms from Holocene paleolacustrine sediments in the Great Western Erg (Guern Abou II, interdune lacustrine depression) made it possible to detect a small diatom species, Pantocsekiella, new to this region.

The study of its morphology in the diatom assemblage from the Guern Abou II section revealed quantitative characteristics (valve diameter, the number of striae in 10 µm, the number of central fultoportulae, the frequency of marginal fultoportulae, the number of lacunae on the valve) and qualitative (valve relief, the presence and location of granules on the valve, the location of lacunae, the orientation of the slit of the rimoportula) allow it to be considered a new species.

P33 – Miscelanea

WWW. DIATOMATLAS.MK – A NEW INTERNET SOURCE FOR DIATOM TAXONOMY AND ECOLOGY

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The Internet is becoming an important source for the taxonomy and nomenclature of diatoms. Several databases contain information on the nomenclature history of taxa, original publications, and some additional data on general ecology and distribution. Only a few databases contain data on species recorded in a specific country/region, including descriptions and illustrations of multiple specimens. Over the past decade, diatom research in N. Macedonia has intensified, resulting in 2,300 species being recorded so far. All observed species are illustrated and described using a light microscope and more than 1000 species with a scanning electron microscope. Additionally, information for morphology, differential characters, comparison with similar taxa, ecology, distribution and threat status of the species in N. Macedonia is provided for each species. The database is searchable by genus, species, author, ecology, locality and conservation status.

www.diatomatlas.mk is a web-based information system that adopts a serverless architecture in which the application programming interface (API) is deployed on a managed container execution environment using Google Cloud Run that provides automatic scaling and stateless service orchestration, while the persistent data storage is handled by Google Cloud SQL, a fully managed relational database service.

This database can be helpful to diatom taxonomists and ecologists, freshwater monitoring experts, conservation institutions, and for those interested in diatom morphology and ecology.

P34 – Miscelanea

SOIL DIATOMS – NEW INSIGHTS INTO THEIR DIVERSITY AND THEIR APPLICATION AS BIOINDICATORS FOR THE SOIL ECOLOGICAL STATUS

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Terrestrial diatom communities comprise species inhabiting substrates moistened exclusively by atmospheric water. Despite their widespread occurrence in habitats such as biological soil crusts, soils, and anthropogenic surfaces, they remain far less studied than aquatic diatoms and their diversity, taxonomy, and ecological roles are still poorly understood. Here, we present the first results of an ongoing project investigating the diversity, taxonomy, and ecological function of terrestrial diatoms in Germany funded by the Deutsche Forschungsgemeinschaft. Soil simples were collected during several seasons from a wide range of habitats such as agricultural soils, meadows, nutrient-poor grasslands, heathlands and dunes, thereby covering pronounced gradients in land use, nutrient availability, and environmental conditions. Initial analyses reveal a surprisingly high diversity, including numerous potentially undescribed species, particularly within the genera *Mayamaea*, *Luticola*, and *Hantzschia*. Within this Project, more than 130 clonal cultures were successfully established providing a robust foundation for integrative taxonomic work. These cultures form the basis for developing a taxonomically validated reference library that integrates morphological characterization with DNA barcodes (rbcL and 18SV4). This reference framework will enable direct comparisons between microscopy-based identifications and DNA metabarcoding approaches, thereby improving the reliability and resolution of biodiversity assessments in terrestrial habitats. In addition, ongoing laboratory experiments aim to determine their tolerance towards desiccation as well as their ecophysiological responses in order to evaluate their suitability as bioindicators of soil ecological status.

P35 – Miscelanea

TOWARDS A STANDARDIZED SAMPLE SIZE FOR MORPHOMETRIC DESCRIPTIONS

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This communication discusses the need for standardized sample sizes in diatom morphometric descriptions to accurately capture species variability. Building on Olenici et al. (2020), it endorses a minimum sample size of 59 individuals using nonparametric tolerance intervals to cover 95% of the population with 95% confidence. It further proposes a log-normal distribution model to scale size ranges from smaller samples to this standard, illustrated by extrapolating a 10–20 µm valve length range (N=10) to 8–25 µm (N=59). This approach enables reliable comparisons of historical type material with modern populations.

P36 – Miscelanea

PROGRESS WITH THE DIATOM FLORA OF BRITAIN AND IRELAND

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The Diatom Flora of Britain and Ireland consists of a web-based diatom flora https://naturalhistory.museumwales.ac.uk/diatoms/ and of accompanying peer-reviewed publications. To date, a total of > 400 species have been uploaded on the website. Despite recent taxonomic revisions there are still problems with the application of many species' names, there are many poorly understood taxa described from Britain together with many species in insufficiently studied habitats that require further study. During the next phase of the flora project, we will carry out taxonomic studies of selected species in light and scanning electron microscopy using diatom collections in the UK and Europe as well as newly collected samples. A particular target for this phase will be the collections of F.T. Kützing (most held in BM), the 'Linnaeus of diatoms', and the collection of Brenda Knudson who pioneered diatom studies in the English Lake District and whose collection has only been recently transferred to BM from the Freshwater Biological Association and is now accessible. We will also compile a summary of 'orphaned' diatom collections in the UK to provide an overview of existing, but unstudied, collections.

P37 – Genomics

"TINY BUT IMPORTANT" – BENTHIC DIATOMS OF THE BALTIC SEA (BENKIESO): DEVELOPING THE FOUNDATIONS FOR INNOVATIVE BIODIVERSITY MONITORING METHODS USING eDNA AND AI-ASSISTED IMAGE ANALYSIS

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Benthic diatoms in the Baltic Sea perform numerous ecologically important functions, such as high primary production and sediment stabilization. Despite extensive research in the Baltic Sea, only fragmentary data on the species inventory of these microalgae is available to date. This contribution presents the launch of the BENKIESO project, funded by the German Federal Environmental Foundation (Deutsche Bundesstiftung Umwelt, DBU), which focuses on benthic diatoms in the Baltic Sea. For the first time, a taxonomic reference database will be established that combines microscopic (light microscopy, SEM) and molecular (sequencing, eDNA metabarcoding) techniques with digital AI-supported image analysis methods based on environmental samples and monoclonal cultures — a combination never before implemented in this form for a microalgal group. Such a reference database is the prerequisite for establishing new monitoring methods for the biodiversity of the understudied benthic diatoms of the brackish Baltic Sea. Similar to their close relatives in limnic environments (EU Water Framework Directive), these species are expected to exhibit high, yet untapped potential as bioindicator species for disturbances (e.g., trawl fishing) and environmental changes (e.g., warming, eutrophication, flooding), which this project aims to investigate. Furthermore, the eDNA metabarcoding approach in particular can also be used to identify new and invasive diatom species. This potential is to be tapped for the first time along the German Baltic Sea coast, with the option of later extending it to other coastal areas. Authorities, decision-makers, and users are to be involved in the process through specialized formats (e.g., exchange of ideas, trainings, intercalibration exercises). The project thus contributes to biodiversity research and efficient environmental monitoring of marine coasts.

P38 – Genomics

EXPLORING DIATOM BIODIVERSITY ON THE POLISH BALTIC COAST USING MOLECULAR AND MICROSCOPIC METHODS

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Diatoms (Bacillariophyta) play a crucial role in marine and coastal ecosystems. Despite their ecological importance, the biodiversity of diatoms in the southern Baltic Sea, particularly along the Polish coast, remains insufficiently explored. Traditional studies in this region have largely relied on light and electron microscopy, which, although effective for morphological identification, can overlook cryptic diversity. In contrast, DNA metabarcoding offers a powerful approach to uncover hidden diversity and improve taxonomic resolution. However, this method has not yet been widely applied to diatom communities in the Baltic Sea. As a result, current knowledge may underestimate species richness and fail to capture the full complexity of diatom assemblages in this ecologically and economically important region.

The main goal of our project is to test how well DNA metabarcoding works for assessing diatom diversity in this region and to begin building a reliable reference database for future biomonitoring efforts. We combine traditional microscopy-based identification with molecular analyses targeting partial 18S rRNA and *rbcL* genes.

Samples are collected from a range of microhabitats along the Polish Baltic coastline. We isolate monoclonal cultures, identify them using light and scanning electron microscopy, and then sequence their DNA to generate species-specific barcodes. All this information, including microscopic images, metadata, and sequences, will help enrich existing public reference databases for diatom metabarcoding.

P39 – Genomics

OPTIMIZING DIATOM IDENTIFICATION: A COMPARATIVE ANALYSIS OF GENOMIC CLASSIFIERS, SEQUENCING APPROACHES, AND REFERENCE DATABASES

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Diatoms are challenging to identify using traditional methods due to high interspecific similarity and wide morphological variability, requiring substantial taxonomic expertise. Recent technological advances provide genetic alternatives to overcome these limitations; however, important gaps remain regarding the most suitable methods for genomic identification.

This poster evaluates three key factors in genomic species classification: sequencing approach, classification software, and reference database. We used single-species libraries from 13 monoclonal non-axenic diatom cultures.

Reads were obtained using two strategies: shotgun sequencing and PCR-based metabarcoding targeting the rbcL gene. The classifiers assessed included two widely used methods, BLASTn + MEGAN (BM) and Kraken2 (K2), as well as a more recent approach, BWA combined with the Gamma-Delta algorithm (BGD). Two types of reference databases were used: whole-genome sequences and rbcL barcode sequences.

Classifier performance was evaluated using the Lowest Common Ancestor (LCA) and the nearest classifiable taxon. Based on the LCA, the divergence between expected and assigned taxa was quantified.

Results showed that reads classified against whole-genome references were generally more accurate, although their limited availability makes barcode databases a more practical option. This pattern was consistent across samples: *Fragilaria crotonensis* was accurately classified regardless of the method used, whereas *Achnanthidium sp.* was constrained by the exclusive availability of barcode references. Furthermore, barcodes exhibited higher specificity than shotgun reads, supporting their use in biodiversity studies. Regarding classifier performance, K2 tended to overclassify, assigning reads to species level even when most supported higher taxonomic levels, whereas BGD was the most specific but failed to classify reads absent from the reference database.

Further research should focus on improving classification algorithms and expanding curated reference databases to enhance taxonomic coverage and assignment accuracy, particularly for underrepresented diatom groups.

P40 – Genomics

TRAIT–ENVIRONMENT INTERACTIONS PROVIDE EVIDENCE FOR KEY EVOLUTIONARY INNOVATIONS IN DIPLONEIS FROM LAKE TANGANYIKA

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The colonization of new habitats is a driving force behind evolutionary change and typically leads to the emergence of new adaptive traits that help organisms survive in their new environment. These phenomena occur particularly frequently in diatoms, as they have colonized virtually all aquatic habitats and ecological zones on Earth. However, there is little evidence of clear key evolutionary innovations in these organisms, although such innovations have been postulated for a unique, highly species-rich endemic group of the genus *Diploneis* from Lake Tanganyika. To investigate this, a time-calibrated molecular phylogeny was used to first test the *in situ* diversification of the Tanganyikan *Diploneis* species. We then investigated whether certain traits function as key evolutionary innovations that drove this diversification. To this end, various continuous and categorical traits of an adaptive, functional, and taxonomically relevant nature were evaluated in all endemic species of the lake as well as in non-endemic species from surrounding areas. To assess the adaptive significance and thus the potential of the traits as key evolutionary innovations, they were first subjected to factor analysis of mixed data. Subsequently, the significant traits were correlated with various environmental conditions using phylogenetic generalized least squares regression. We found that *Diploneis* species evolved *in situ* during the early stages of lake formation and rapidly diversified to occupy the newly emerging niches in the lake. This diversification was likely facilitated by key innovations, as suggested by the observed positive correlation across multiple traits, particularly in the fin structures on the outer cell wall of the lake species. While these correlations suggest adaptive relevance, further evidence from genomic and transcriptomic data is required to confirm both their functional roles and their status as key evolutionary innovations.

P41 – Genomics

FOUR HIGH-QUALITY REFERENCE GENOMES EXPAND GENOMIC RESOURCES FOR PENNATE DIATOMS

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Despite their enormous diversity, with an estimated 100,000 – 200,000 extant species, genomic resources of diatoms remain scarce. At the time of writing this abstract, there are only 73 reference diatom genomes available from the National Center for Biotechnology (NCBI) database, of which the vast majority are from centric diatoms. This shows that sequencing efforts have generally been directed towards centric diatoms, and that we currently have only a handful of pennate diatom genomes. Clearly, there is an urgent need for expanding genomic resources of diatoms.

Here, we present four high-quality reference genome assemblies of the marine, globally widespread, pennate diatom genus Cylindrotheca. While only a handful of species have been described, Cylindrotheca has recently been shown to harbour extensive cryptic diversity that is sorted across climate zones. Four of these cryptic taxa, covering polar to tropical regions, were selected for whole-genome sequencing with Oxford Nanopore Technologies long-read sequencing. Reads were filtered using a long-read–first strategy to ~100x coverage and multiple assemblers were compared to optimise contiguity and completeness. Final assemblies reached contig N50 values up to 5.94 Mbp, with fewer than 50 contigs per assembly, nearing chromosome-level resolution. BUSCO analyses indicated near-complete genomes (>98%). In addition to protein-coding genes, the assemblies were annotated using multi-condition RNA-seq to include untranslated regions (UTRs), tRNAs, and rRNAs.

These high-quality reference genomes will enable future research on speciation and genome evolution in diatoms. Specifically, we aim to unravel the genomic basis of climate adaptation in Cylindrotheca through comparative genomics of genomes collected from different climate zones, covering both inter- and intraspecific variation in the genus.

P42 – Genomics

DNA-BASED VALIDATION OF HYDROMORPHOLOGICAL TYPOLOGY BASED ON PHYTOBENTHIC COMMUNITIES IN RIVERS AND LAKES

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The European Union Water Framework Directive (WFD) requires the assessment of the ecological status of surface waters, which is based on water body–specific typology and the definition of reference conditions. In this study, we validated the river and lake typology of Hungary using the phytobenthos biological quality element, by comparing traditional morphology-based assessment methods with environmental DNA (eDNA)-based technology. For the latter, metabarcoding was applied by amplifying a 312 base pair (bp) fragment of the rbcL marker gene. Our results showed that morphology-based taxonomic identification generally yielded higher species richness and more clearly separated typological groups in a statistical sense, particularly in rivers. The eDNA-based method resulted in higher species richness in lakes, but typological classification was less distinct. In terms of ecological status assessment (e.g., IPS and IPSITI indices), the two approaches showed strong correlation; however, the eDNA-based assessment proved to be systematically more stringent, assigning samples to poorer status classes. eDNA technology represents a promising complementary tool, but further development of Hungarian reference databases and additional parallel studies are required before it can fully replace morphology-based taxonomic methods in routine monitoring practice.

OBSERVATION ON THE GENUS MICROCOSTATUS JOHANSEN & SRAY (BACILLARIOPHYCEAE) IN MACEDONIA

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The genus *Microcostatus* Johansen & Sray was separated from *Navicula* Bory on the basis of several ultrastructural features such as small costae extending across the axial area (microcosta), presence of two longitudinal lyre-shaped depressions located on both sides of raphe sternum and a simple raphe system. Most of the species inhabiting subaerial habitats, such as wet rocks and mosses, but some species inhabiting estuarine intertidal and marine habitats. Observations of *Microcostatus* from Macedonia reveal presence of 10 taxa: six of them belong to already described species, while four of them have different morphological and ultrastructural features than already known species. All taxa are illustrated by light and scanning electron microscope and their main differential characters are presented. *Microcostatus* sp. 1 has similar ultrastructural features as *Navicula naumanni* var. *simplex* Foged, but can be differentiated by the valve outline and shape of the central area. *Microcostatus* sp. 2 has similar hyaline appearance as *M. kuelbsii* (Lange-Bertalot) Lange-Bertalot, but can be differentiated by the valve shape and stria morphology. *Microcostatus* sp. 3 has similar stria structure as *Sellaphora terrestris* Glushchenko, Kezlya, Maltsev & Kulikovskiy, but differences can be noticed in the valve outline and the shape of the central area. *Microcostatus* sp. 4 can be differentiated from *M. turritus* P.B.Hamilton & D.Antoniades by the valve shape and size.

All *Microcostatus* species presented in this study were recorded from subaerial habitats or small alpine ponds/glacial lakes.

DIGITAL DIATOM TAXONOMIC INTERCALIBRATION AND HARMONIZATION – LESSONS LEARNED FROM THE FIRST EXERCISE

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Abundance counts, i.e., taxonomic identifications and enumerations of diatom valves and frustules in light microscopy images, are a well-established method in biomonitoring, water quality control and biodiversity assessment. Training and updating taxonomic knowledge are essential for this task, but the availability of practical workshops and options for collaborative microscopy are limited.

To address this gap, we implemented "UDE BioSLiDES digs into Diatoms", a virtual microscopy system which makes it possible to run identification tasks on digitized samples in the web browser, with a workflow, visual impression and controls very close to working directly on the microscope. This approach allows groups of diatomists to collaboratively investigate large numbers of exactly the same diatom individuals, simultaneously or even in an asynchronous manner, and opens completely new ways for training and discussing taxonomy.

As a first test of this system, we performed a harmonization exercise engaging 12 diatom experts, where we had planned to analyse four different slides (two from Sweden, two from France), and for each slide have ca. 300 individual diatom valves or frustules each taxonomically identified by six of the experts. This procedure mimicked a conventional ring test / intercalibration, but was run with

the intent of harmonizing taxonomic concepts between the experts. Here we present our experiences and first results of this exercise.

THE CENTRAL COLLECTION OF ALGAL CULTURES (CCAC) AT THE UNIVERSITY OF DUISBURG-ESSEN

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The Central Collection of Algal Cultures (CCAC) of the University of Duisburg-Essen is a unique repository of microalgae with ca. 7500 strains from marine (15%) and freshwater (85%) environments. CCAC is the only repository for > 90% of these strains. This extensive collection includes a significant number of axenic strains and represents a broad phylogenetic diversity, spanning all major algal groups, including almost 300 diatom strains. This makes CCAC an invaluable resource for comprehensive evolutionary and ecological research, multi-omics projects and the development of interdisciplinary collaborations. Furthermore, the collection can provide a virtually inexhaustible resource to assess different physiological styles and molecular mechanisms, offering great potential for developing innovative technologies and environmentally friendly solutions to global challenges such as carbon sequestration and wastewater treatment. Finally, by preserving and providing access to its strains, CCAC not only promotes research, but also conserves algal genetic diversity. In this contribution, we describe how CCAC can promote interaction of experts from different research areas and public sectors to bridge existing gaps and meet the demands of a changing world and science, where both a detailed in-depth understanding of processes and a wide taxonomical coverage are equally important.

DIATOM DICTIONARY: ENABLING TAXONOMY HARMONIZATION THROUGH REPRODUCIBLE WORKFLOWS

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Diatom palaeoecological records hold exceptional potential for large-scale syntheses, yet their integration remains constrained by evolving taxonomy, synonymy, and ambiguous nomenclature. This contribution introduces an ongoing Short-Term Scientific Mission (COST Action CA23116 PalaeOpen) that aims not only to develop a reproducible "diatom dictionary" tool, but also to provoke a broader discussion within the diatom community: what level of taxonomic harmonization is both achievable and acceptable for robust meta-analyses?

The proposed workflow combines existing taxonomic resources (e.g. DiatomBase, USGS Biodata, OMNIDIA) with the Neotoma diatom master list to systematically compare and standardize original taxon lists. Implemented as a fully documented R-based pipeline, the tool will generate transparent outputs that support data stewards of the European Freshwater Palaeoecology Database in resolving synonymy, correcting misspellings, and making explicit decisions about taxonomic resolution (species vs. genera levels, handling of taxonomic uncertainties such as cf./ aff./ spp.). Tested on a diverse set of Holocene lake records, the approach aims to accommodate variability across modern and paleoecological datasets while maintaining reproducibility and Open and FAIR data practices.

However, rather than presenting a finalized solution, this poster adopts an interactive format to actively engage the community. Participants will be invited to explore key decision points in taxonomic harmonization, confront practical limitations, and reflect on the necessary compromises between taxonomic precision and interoperability when input data are only species lists. By making these challenges explicit, we seek to identify practical steps towards nomenclatural harmonization that preserve ecological meaning while enabling large-scale synthesis.

Ultimately, this contribution places diatom taxonomic harmonization not only as a technical task but as a collective, community-driven process. Establishing shared, transparent practices is essential for unlocking the full potential of diatom records in continental-to-global meta-studies and for strengthening confidence in open palaeoecological data infrastructures.

CONNECTING DIATOM COLLECTIONS: A FIRST STEP

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Diatom collections are scattered across numerous institutions and represent a unique but highly fragmented resource for biodiversity-related research. While individual collections are often well known within specific communities, there is currently no clear and accessible overview of where these collections are located, what they contain, how they are curated, and most importantly, how they can be accessed.

This poster presents an initial effort to bring together information on major diatom collections, with a particular focus on European holdings. The aim is to improve visibility, facilitate both virtual and physical access, and highlight the collective potential of these collections as research infrastructures.

By outlining current gaps and opportunities, we propose a first step towards stronger coordination among diatom collections. This includes sharing basic information on holdings, improving accessibility, and fostering collaboration between institutions. As a next step, we envision a dedicated session or workshop at a future international diatom meeting to further develop these ideas.

This contribution is intended as an open invitation to the community to engage in a collaborative effort to better connect, open and activate diatom collections.

P48 – Collections and Intercalibrations

ENSURING REPRODUCIBILITY AND TAXONOMIC CONSISTENCY IN DIATOM ANALYSIS: INTERCOMPARISON EXERCISES

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Diatoms are a key biological quality element under the Water Framework Directive (WFD), providing sensitive and reproducible signals of ecological degradation in river systems. Because diatom assessments rely heavily on taxonomic accuracy and consistent analytical procedures, rigorous quality control is essential to ensure reliable ecological status classification. To guarantee the quality and reliability of analytical results, laboratories are required to contrast their performance with external entities in order to evaluate their technical competence and the reliability of their analyses, thereby guiding their processes toward continuous improvement.

Intercomparison exercises are an essential tool to ensure the quality of analytical results and, consequently, the reliability of ecological index calculations. Through these exercises, reproducibility, comparability and robustness of the assessments are achieved, and participating laboratories gain insight into their ability to produce results that meet the required quality standards. Since 2019, Phytolab Control (now Tentamus LAB) has coordinated annual intercomparison rounds focused on benthic diatoms from continental waters, involving laboratories from different regions and methodological backgrounds. These exercises evaluate taxonomic consistency, quantification accuracy and the calculation of ecological indices under standardized conditions.

This work presents the objectives, design and stages of the intercomparison scheme, as well as the application of robust statistical approaches—including outlier treatment, assigned values, z scores and uncertainty estimation—for assessing laboratory performance. The results demonstrate that intercomparison schemes not only support quality assurance in routine monitoring but also contribute to harmonizing taxonomic criteria, improving data reproducibility and strengthening the reliability of diatom based bioassessment frameworks. These findings highlight the importance of coordinated quality control initiatives within the diatom research community and their relevance for open, transparent and reproducible science.

TOWARDS A DIATOM REFERENCE COLLECTION IN THE CANARY ISLANDS: INTEGRATING CULTURES, MORPHOLOGY, AND GENETICS

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Diatoms (class Bacillariophyta) are a diverse group of photosynthetic organisms that play a key role in aquatic ecosystems and are characterized by the presence of frustules with silica cell walls. Despite their ecological relevance, most studies conducted in the Canary Islands are limited to species checklists, highlighting their strong potential for further research in the archipelago from taxonomic, ultrastructural, and molecular perspectives.

To promote their study, strengthen integrative taxonomy, and develop long-term reference infrastructures, the establishment of a diatom collection at the Museo de Ciencias Naturales de Tenerife is being undertaken and is currently in a preliminary phase. This collection is conceived as a scientific repository to ensure the preservation, traceability, and accessibility of biological materials and associated data, facilitating reproducible taxonomic comparisons as well as evolutionary and ecological studies across multiple scales.

To this end, systematic sampling of benthic and planktonic diatoms will be conducted, followed by single-cell isolation to establish clonal cultures. Once sufficient cell growth and biomass are achieved, subcultures will be generated for an integrative analytical approach, including: (1) morphological characterization using light and high-resolution electron microscopy; (2) preparation of permanent microscope slides as reference material, together with an associated DNA collection; (3) development of databases containing sequences from different genetic markers; and (4) maintenance of living cultures under controlled growth conditions.

Preliminary studies initiated in 2024 have provided morphological and genetic data for two benthic diatom species collected from the intertidal zone of Tenerife, suggesting their possible novelty for the Canary Islands. These results demonstrate the feasibility of the proposed approach and its potential to establish a robust reference collection contributing to advances in the

taxonomic, molecular, and ecological knowledge of diatoms in the Canary Islands.

DIATOMS AND OTHER SILICEOUS MICROORGANISMS AS COMPLEMENTARY FORENSIC INDICATORS IN DROWNING DIAGNOSIS

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The diatom test remains a cornerstone in the post-mortem diagnosis of drowning, yet its reliability can be limited in diatom-poor or atypical aquatic environments. This study evaluates the forensic potential of additional siliceous, non-diatom microorganisms, including chrysophyte cysts and scales, freshwater sponge spicules, ebridians, and phytoliths, detectable using standard diatom preparation techniques. Drawing on interdisciplinary expertise in palaeoecology and marine biology, as well as over 1,500 medico-legal drowning investigations, we demonstrate that these silica-based microremains withstand conventional acid digestion and provide valuable complementary evidence.

Their systematic inclusion in routine microscopic analysis enables a multi-proxy approach, enhancing environmental interpretation and strengthening diagnostic confidence. This approach is particularly beneficial in cases where traditional diatom analysis is inconclusive, thereby reducing uncertainty in the forensic diagnosis of drowning.

SEQUENTIAL DEEP EUTECTIC SOLVENT FRACTIONATION OF DIATOM BIOMASS: TOWARDS INTEGRATED RECOVERY OF FRUSTULES AND ORGANIC COMPOUNDS

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Diatoms are unicellular photosynthetic microalgae defined by their ornately structured silica cell walls, the frustules, and a chemically rich intracellular matrix comprising lipids, pigments, carbohydrates, and proteins. This coupled inorganic-organic architecture makes diatoms uniquely complex biological systems, where structural and biochemical dimensions are deeply intertwined. Yet conventional processing approaches typically isolate either the frustule or a single organic fraction, relying on harsh oxidative or solvent treatments that compromise the integrity of remaining compounds.

This work presents a sequential fractionation methodology based on deep eutectic solvents (DES), tunable, low-volatility solvent systems with demonstrated capacity for selective biomolecule solubilization under mild conditions. The approach recovers hydrophilic and hydrophobic organic fractions stepwise while preserving frustule morphology throughout, enabling simultaneous access to the full chemical inventory of the diatom cell without destructive trade-offs between fractions.

Extraction selectivity is governed by DES composition and physicochemical parameters including temperature and solvent-to-biomass ratio. Particular attention is given to the molecular stability of sensitive compounds like pigments and polyunsaturated lipids, which are prone to degradation under conventional extraction conditions. Recovery efficiency and structural integrity are assessed within a green chemistry framework, using quantitative and microscopy-based approaches.

By treating diatom biomass as an integrated multi-compound system rather than a single-target resource, this methodology enables comprehensive biochemical characterization of diatom cells, with implications for both fundamental research into diatom biology and the sustainable application of diatom biodiversity.

P52 – Forensic Sciences and other applications

INVESTIGATING THE DUAL-YIELD POTENTIAL OF CRASPEDOSTAUROS SP. FOR LIPID AND SILICA CO-PRODUCTION

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Diatoms represent a promising candidate for sustainable biotechnological applications, capable of growing across diverse water sources they avoid direct competition with arable agriculture and produce high-value compounds that have the potential to be co-extracted. Their well-characterised silica frustules offer a biogenic alternative to conventionally mined quartz-derived silica, the second most used non-renewable resource that require energy-intensive purification processes to achieve comparable material quality. They accumulate substantial lipid fractions (15–25% of cellular dry weight) including PUFA-rich membrane lipids such as EPA (20:5 n-3), DHA (22:6 n-3), and ARA (20:4 n-6) valued for nutraceutical and dietary supplement applications, alongside triacylglycerols enriched in C14 and C16 fatty acids suitable for biodiesel production. Exploiting both fractions from a single biomass stream could considerably improve resource efficiency and improve the economic value of the biomass.

This study characterises the fatty acid profile of *Craspedostauros* sp., a biraphid pennate diatom and established production strain. Biomass was subjected to varying storage and preservation methods including freeze-drying followed by room-temperature storage and refrigerated storage to assess post-harvest compositional stability. Three cell disruption approaches were compared: no lysis, dilute acid treatment (1% H_2SO_4), and probe-based ultrasonication. Total lipids were extracted using a modified Folch-based solvent protocol and validated by thin-layer chromatography. Fatty acid methyl esters were prepared via both acid- and base-catalysed transesterification and quantified by GC-MS using an internal standard. Frustule integrity was determined through SEM imaging. Results are currently being finalised, but preliminary data indicate measurable differences in fatty acid composition across storage conditions and lysis methods. This work provides baseline compositional data for one production strain and explores practical production, storage, and logistics variables relevant to industrial-scale processing.

ANALYSIS OF DIATOMS IN ANIMAL TISSUES AS A FORENSIC TOOL

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Submersion death diagnosis is often challenging in forensic science. Several diagnostic methods exist, but one of the classical approaches is based on the use of diatoms. These microalgae can be inhaled during drowning and may reach the heart, kidneys or femoral bone marrow. The detection of these organisms in such organs is considered strong evidence of drowning.

Diatom-based methods used to date rely on highly aggressive acid digestion techniques to remove all organic matter, leaving only the siliceous frustules of diatoms. However, these methods are highly susceptible to material loss and contamination, which increases the risk of false-negative results.

In this study, a procedure is proposed for the analysis of diatoms in animal tissues using microscopy-based techniques. Cardiac tissue was infiltrated with a suspension containing four diatom species, with different morphology and size, isolated from the Mar Menor coastal lagoon (Murcia, SE Spain), preserved in formalin and embedded in JB-4 resin and paraffin. Histological sections were stained with hematoxylin-eosin, toluidine blue, and DAPI, and examined by bright-field, fluorescence and confocal laser scanning microscopy.

The results confirm that diatoms can be effectively detected without harsh chemical tissue digestion, offering a safer and more environmentally friendly alternative for forensic investigations.

CAN DIATOMS POWER THE FUTURE OF NANOCOMPOSITES?

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This work presents an overview of our recent achievements in the use of marine diatom strains to produce nanostructured materials. We demonstrated that diatom biosilica can serve as a natural template for the fabrication of metal-based nanocomposites, including silver, gold, zinc oxide, as well as iron oxide nanoparticles. These materials can be formed directly on frustule surfaces or in the surrounding medium through environmentally friendly biosynthetic routes. The resulting composites exhibit high surface area, tunable physicochemical properties, and promising performance in environmental applications, particularly in the removal of heavy metals and organic pollutants from water.

Our studies confirm that diatoms can function as both biological templates and active participants in nanoparticle formation, supporting the concept of multifunctional biocompostes. The integration of metal nanoparticles with biosilica matrices enables the design of hybrid materials with enhanced catalytic and sorption properties.

Ongoing research is also focused on the blue diatom *Haslea* spp., particularly on the use of the pigment marennine as a reducing and stabilizing agent in nanoparticle synthesis. This approach opens new perspectives for fully biogenic and low-toxicity production methods. Our findings demonstrat that diatoms represent a promising, renewable resource for the design of innovative nanocomposites with applications in environmental protection, medicine, or industry.

ISOLATION AND CHARACTERIZATION OF CULTIVABLE EPIPHYTIC DIATOMS FROM COMMERCIAL ATLANTIC NORI PORPHYRA UMBILICALIS AND P. DIOICA

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Red seaweeds of the genus *Porphyra*, primarily cultivated in Southeast Asia for nori, are increasingly being produced on other continents due to their nutritional benefits, bioactive compounds, and the rising demand for sustainable goods. A major challenge in Porphyra cultivation is disease occurrence, caused by viruses, bacteria, oomycetes, and epiphytic outbreaks associated with diatom felt or blooms, which can reduce thallus growth through shading and nutrient depletion, or cause blade bleaching. Current treatments are little effective, may cause negative environmental impacts, and increase production costs up to 30% to control epiphytes. This study investigated epiphytic diatoms associated with Porphyra dioica and P. umbilicalis thalli produced by the Portuguese company ALGAplus. Sixteen blade samples from both *Porphyra* species were collected from outdoor cultivation tanks, including thalli exhibiting visible alterations such as patchy discoloration or surface changes, as well as thalli with healthy colour and morphology. Diatoms were isolated by micropipetting, swabbing and agar spread plate methods, then cultured and maintained in f/2+Si culture media. Nineteen diatom isolates were identified and characterized using molecular (SSU, LSU, and rbcL marker genes) and morphological (SEM- scanning electron microscopy) approaches. Identified species included *Halamphora* cf. *tenuissima* and *Amphora micrometra*, both isolated from healthy-looking thalli, and *Navicula salinicola*, *Nitzschia* cf. *palea*, and *Nitzschia* amabilis from unhealthy-looking thalli. Additionally, antagonistic activity against these diatoms was tested with extracellular extracts obtained by solid-phase extraction from fourteen

bacterial strains isolated from the algae's own microbiome. The bacterial extract of *Tritonibacter* sp. Pdi57 inhibited *Navicula salinicola* growth. Co-culture assays of selected diatom and bacterial strains are now planned to test if Porphyra-associated bacteria can inhibit diatom growth or photosynthetic efficiency in vivo. In conclusion, this study offers initial insights into the culturable diatoms associated with diatom felt in *Porphyra* spp. and suggests potential biological control opportunities through microbiome manipulation.

A SUGARY PERSPECTIVE AT DIATOMS

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Diatom-derived complex anionic polysaccharides play a key role in marine carbon sequestration. As biological adhesives, these polysaccharides are pivotal to marine particle formation, and their complex structures make them challenging to degrade by microorganisms. Yet, these polymers are largely unknown, and their functions are elusive due to analytical constraints. Here, we present a workflow combining anion-exchange chromatography and mass spectrometry to purify and analyze distinct anionic polysaccharides from the diatom *Conticribra weissflogii*. We find that *C. weissflogii* produces three anionic polysaccharides of varying complexity: one fucogalactan and two mannans. Moreover, we can show that *C. weissflogii* modulates its secretion in response to light, nutrients, temperature, pH, and growth state. Light, temperature, pH, and growth state influence the total amount of secreted polysaccharides. In contrast, nutrient limitation evokes differential secretion of individual polysaccharides. This points to anionic polysaccharides as sensitive response-agents with different functions and priorities to the diatom. In conclusion, our workflow opens the door to studying overlooked diatom-derived anionic polysaccharides, an untapped pool of dissolved organic matter crucial to understanding the fate of carbon in the ocean.

PHYTOTOXIC ACTIVITY OF CAULERPA PROLIFERA METHANOLIC EXTRACTS ON THE BENTHIC DIATOM FISTULIFERA SAPROPHILA FROM THE EUTROPHIC MAR MENOR COASTAL LAGOON

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The green alga *Caulerpa prolifera* is a dominant macrophyte in Mediterranean coastal lagoons and a well-known producer of bioactive secondary metabolites, particularly the sesquiterpene caulerpenyne, yet the role of its chemical defences in shaping epiphytic diatom assemblages remains poorly understood. Here, we provide a combined morphological and molecular characterisation of a *Fistulifera saprophila* isolate from epipelic biofilms in the Mar Menor coastal lagoon, and experimentally assess the effects of *C. prolifera* methanolic extracts on its growth under controlled laboratory conditions. Morphological examination was consistent with previous descriptions of the taxon. Molecular identification using genetic markers placed the isolate within a well-supported monophyletic *Fistulifera* clade, confirming its identification as *F. saprophila*. Sustained growth at 42 psu extended the documented halotolerance of this species beyond previously reported limits, further supporting its classification as a euryhaline and opportunistic taxon. Growth inhibition bioassays revealed a clear concentration-dependent response to three concentrations of *C. prolifera* methanolic extracts over 28 days. The lowest concentration induced transient and reversible suppression, suggesting active cellular acclimation. In contrast, the two higher concentrations caused rapid and near-complete inhibition of cell proliferation from day 7 onwards, indicating that above a threshold, extract bioactivity exceeds the homeostatic capacity of the diatom. Given that macroalgal material was collected in winter, when caulerpenyne concentrations are expected to be at seasonal minima, these results likely represent a conservative estimate of the bioactive potential of *C. prolifera*. Overall, these findings demonstrate that *C. prolifera* methanolic extracts contain bioactive compounds capable of concentration-dependent inhibition of *F. saprophila* growth, consistent with a potential role for chemical defence in structuring epiphytic assemblages. The bioactive properties of *C. prolifera* extracts represent a promising avenue for future research, with potential applications in the natural control of marine biofouling.

DIATOMS FROM INTERMITTENT RIVERS ACROSS EUROPEAN BIOGEOGRAPHY

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Seasonal drying of rivers is a globally increasing phenomenon, caused by global climate change and with significant implications for riparian ecosystems. Many rivers now experience partial or complete desiccation—ranging from mild to severe—disrupting longitudinal connectivity and leading to highly variable pool dynamics. In extreme cases, complete drying drives benthic diatom communities toward terrestrialization, threatening endemic species and altering community composition. The ecological consequences of drying vary markedly across latitudinal gradients: in drier climates, desiccation promotes rapid terrestrialization, whereas in more humid regions, biofilms retain moisture more effectively, supporting greater community persistence. Despite initial comparative studies, the universality of diatom resistance and resilience mechanisms across latitudes remains poorly understood. Latitudinal differences in humidity influence not only species survival but also community turnover and nestedness patterns. In humid environments, prior colonization by moisture-adapted species may lead to stronger priority effects, higher nestedness, and reduced turnover—features that enhance ecosystem resilience. As drought frequency increases and river connectivity declines, these latitudinal disparities necessitate region-specific management strategies to ensure compliance with the European Water Framework Directive. Understanding and accounting for these biogeographical gradients is essential for effective conservation and restoration of seasonal river systems.

INFLUENCE OF PHYSICO-CHEMICAL FACTORS ON PERIPHYTIC DIATOMS IN SOUTH ADRIATIC MARINE LAKES

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The influence of water chemistry on benthic diatom communities colonizing artificial substrates in two marine lakes, Malo Jezero and Veliko Jezero, located in Mljet National Park (South Adriatic, Croatia), was studied. Glass and Plexiglas slides were deployed at two depths (near the bottom and 0.5 m below the surface) and sampled monthly from April to October 2019. Seawater temperature and salinity were measured in situ using a CTD probe (Seabird Seacat 19plus), while seawater samples were collected for laboratory analyses of key physico-chemical parameters, including nitrates, nitrites, ammonia, phosphates, silicates, oxygen saturation, and chlorophyll *a* concentration. During the seven-month study, across both stations and depths, average salinity and sea temperature were 38.11 and 22.88 °C, respectively, oxygen saturation remained >100% indicating good aeration, and ChL a was 0.17 µg L^{-1}. Dissolved nutrient concentrations averaged 0.21 µM NO_3^-, 0.02 µM NO_2^-, 0.24 µM NH_4^+, 0.09 µM PO_4^{3-}, and 3.68 µM SiO_4^{4-}. A total of 157 taxa from 51 diatom genera were identified, with the highest diversity recorded in *Mastogloia* (29 taxa), *Diploneis* (12), *Nitzschia* (11), *Navicula* (9), and *Amphora* and *Licmophora* (7 each). Despite considerable species richness, temporal trends were not evident, although changes in water chemistry over time and between stations were reflected in diatom community composition. Both temporal and spatial variations in water chemistry influenced periphytic assemblages, highlighting the sensitivity of benthic diatoms to local nutrient dynamics in semi-enclosed coastal marine lakes.

P60 – Epiphytes and symbionts: microhabitats and ecological relationships

FRESHWATER DIATOMS OF THE CANARY ISLANDS: ENVIRONMENTAL DRIVERS OF THEIR ASSEMBLAGES

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Freshwater island streams are isolated systems often characterised by dynamic and fluctuating hydrological regimes with a great potential to host unique aquatic biodiversity. However, the processes structuring benthic diatom communities in these habitats remain poorly understood. As part of the CONACAN project diatom samples and in situ water parameters were collected from 38 permanent and temporary streams located in Tenerife, La Palma, and La Gomera islands (Canaries archipelago) over three sampling campaigns. Three distinct diatom communities were identified, each associated with specific geo-climatic and water chemistry conditions that were generally characteristic to a particular island, though with important exceptions. When analysed together, local (water physico-chemistry, altitude) and regional factors (geological time, lithology, land cover) jointly shaped species composition of diatom communities in Canary Islands watercourses, rather than a single overarching driver. Other unmeasured environmental factors such as periods of drought, water extraction regimes or biotic interactions as well as historical island colonization events, likely influenced the observed community patterns. Alongside ecological results some interesting biogeographical aspects emerged, like the rediscovery of *Nitzschia macaronesica* and *N. tenerifa* that could be endemic to the Macaronesian region.

EPIPHYTIC DIATOMS ASSOCIATED WITH THE INVASIVE ALGA ULVA AUSTRALIS

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The invasive green macroalga *Ulva australis* plays a significant role in coastal ecosystems by modifying substrate availability and influencing associated epiphytic communities. This study investigated the composition of epiphytic diatoms colonizing *U. australis* collected from a shallow coastal site in Chioggia, Italy. Samples were collected directly from the shoreline in triplicate, and diatoms were removed by scraping the algal surface. The material was suspended in distilled water, fixed in 4% formaldehyde and analyzed using light microscopy. Taxonomic identification was carried out to the lowest possible level based on morphological characteristics. A total of 23 diatom taxa were identified, distributed across five classes, 10 orders and 12 families, indicating considerable taxonomic diversity. Bacillariophyceae was the dominant class (12 taxa; 52.17%), followed by Fragilariophyceae (7 taxa; 30.43%). Melosirophyceae accounted for 2 taxa (8.70%), while Striatellaphyceae and Thalassiosirophyceae were each represented by a single taxon (4.35%). Pennate diatoms predominated, including species such as *Achnanthes longipes*, *Cylindrotheca closterium*, *Navicula lanceolata*, and several *Nitzschia* species (*N. archibaldii, N. longissima,* and *N. sigmatella*), which are typically associated with benthic habitats and nutrient-rich environments. Genera such as *Gyrosigma* and *Pleurosigma* indicate strong substrate affinity and adaptability to dynamic conditions. Fragilariophyceae included colonial and stalk-forming taxa such as *Tabularia fasciculata* and multiple *Licmophora* species (*L. abbreviata, L. flabellata, L. gracilis,* and *L. grandis*), which are well adapted for attachment to macroalgal surfaces. The presence of *Grammatophora marina* and *Tabellaria flocculosa* further highlights the importance of colony-forming strategies in epiphytic assemblages. Additionally, *Striatella unipunctata*, a typical mucilage-producing species, emphasizes specialization for epiphytic life. Centric diatoms, including *Melosira lineata, Melosira nummuloides*, and *Cyclotella striata*, indicate a contribution from planktonic communities. The epiphytic diatom assemblage associated with *U. australis* shows high functional and structural diversity, indicating that this invasive alga provides a heterogeneous microhabitat that enhances benthic–pelagic connectivity in coastal ecosystems.

EFFECTS OF STRUCTURAL IMPROVEMENT MEASURES ON DIATOM COMMUNITIES WITHIN THE URBAN AREA OF BRAUNSCHWEIG (GERMANY)

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Many European rivers are structurally degraded, resulting in a poor ecological status under the WFD. In recent years, structural improvement measures have increasingly been implemented on rivers and streams, including within the urban area of Braunschweig. In a master's thesis, 32 samples were collected in 2025 to study the benthic diatom communities along the Schunter River in Braunschweig (Germany). Additionally, water and sediment were sampled while physicochemical parameters and nutrient levels were measured. The study examined whether recent structural upgrades altered benthic diatom composition, how this impacts PHYLIB assessments, and if diatoms can serve as bio-indicators of the measures' success. Although the diatom communities differ in species composition, no statistically significant differences were found between sites with and without structural improvements. Cluster analysis revealed four groups distinguished mainly by their dominant taxa (e.g., *Achnanthidium minutissimum*, *Amphora pediculus*, *Navicula/Nitzschia*, *Diatoma vulgaris*) and relative abundances. Each sample contained 38–72 taxa (mean ≈ 56); a core set of 19 species occurred in ≥ 75 % of the 32 sites. Renaturalized sites are less dominated by individual species than undisturbed sites; however, this difference is insufficient to demonstrate the effectiveness of the measures based on diatom indices. When applying the German PHYLIB system, neither the reference species index nor the trophic index reflects structural improvements: Trophy values are predominantly in the meso- to polytrophic range and correspond to high phosphorus concentrations, while high reference species sums are often attributable to the dominance of individual reference species and thus do not allow conclusions to be drawn about habitat heterogeneity. Diatoms can serve as bioindicators of structural change, but the current PHYLIB tool lacks sufficient sensitivity. An adapted assessment should incorporate successional patterns, species-specific responses (e.g., to flow velocity), and supporting physico-chemical data to evaluate the success of improvement measures plausibly.

EXPERIMENTAL STUDIES OF BIOTIC INTERACTIONS AMONG DIATOMS GUILDS

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Biotic interactions within benthic biofilms play a central role in the structure and function of aquatic ecosystems. Diatoms are a component of such biofilms and are classified into three ecological guilds: low-profile, high-profile and motile. The different guilds colonize distinct microhabitats within the biofilms and have correspondingly diverse adaptations. Priority effects and competitive exclusion operate between the guilds. However, it has not been investigated in detail to what extent priority effects and competitive exclusion influence the composition of the guilds – and thus also the biofilm composition – when an invader encounters a pre-colonized species. To address this, an attempt was made to establish a new method and use this to perform an experiment testing biotic interactions between diatom strains, belonging to different guilds. Our results showed strong priority effects, i.e., the resident strain hindered the colonization of the invader strain in the early succession stage, and competitive exclusion after two weeks. Moreover, the low-profile strain performed significantly better in terms of competitiveness compared to the motile strain. The method comparison revealed agreement between manual and digital analysis for samples with high cell counts, but no agreement for samples with low cell counts. Ultimately, the results show early succession processes in biofilms and could be a potential method for further investigations. We believe that this methodology could serve as a starting point for way more detailed investigations of these biotic interactions.

FRESHWATER COCCONEIS SPECIES (BACILLARIOPHYCEAE) IN NORTHERN ITALY: NEW FINDINGS AND IMPLICATIONS FOR QUALITY ASSESSMENT

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In this study, we conducted a morphological analysis of selected Cocconeis Ehrenberg taxa from northern Italy, including samples from watercourses monitored within the Filiera ASTRO project.

The genus Cocconeis is well represented in the samples, reaching up to 53% relative abundance in the AP, and includes several taxa previously unidentified at species level. Our analysis allowed the identification of common species such as C. pseudolineata, C. pediculus and C. placentula. We also confirmed the presence of recently described taxa, including C. fetscheriana, C. czarneckii, C. coreana, C. ectorii, and C. cf. sijunghoensis. The latter two were additionally validated through rbcL sequence data obtained by environmental DNA metabarcoding. Among unidentified taxa, Cocconeis sp. 1 was frequently observed, reaching up to 20.5% abundance in the study area.

In ecological assessments under the Water Framework Directive (WFD) in Italy, the Intercalibration Common Metric Index (ICMi) is applied, combining IPS and TI values calculated with OMNIDIA. However, indicator values (s; v) are still lacking for many species. For instance, C. fetscheriana reached up to 36% abundance but lacks ecological values. The occurrence of C. ectorii, previously reported in Europe only from Germany and Spain and not separated from C. euglypta, is also noteworthy.

The detection of recently described species within the C. placentula group highlights the need for further ecological studies to assign indicator values. An initial ecological characterization of the species will be conducted within the framework of the project, contributing to improved taxonomic resolution and more accurate diatom-based ecological assessments.

Plates illustrating the sternum valve are provided for all species, while raphe valve, valvocopulae and SEM images are presented for a subset.

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DIVERSITY OF ACHNANTHIDIACEAE (BACILLARIOPHYCEAE) IN A MOUNTAIN LAKE IN ITALY

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Diatom diversity in lakes is poorly studied in Italy, although recent surveys have been conducted on lakes requiring classification under the directive using the EPIL index (WFD-compliant for Italy).

Moreover, for mountain lakes studies in Italy are limited and as observed for other extended studies in Europe, for the genus Achnanthidium Kützing, most of inventories probably refer to Achnanthidium minutissimum sensu lato for most of taxa.

Preliminary results of an in-depth LM analysis of *Achnanthidium* species in a mountain lake (Lake Lower Fusine) are here presented as well as other Achnanthidiaceae. Amplicon sequence variants (ASVs) of the rbcl region are compared to the LM taxa list.

Lower Lake Fusine was studied in 5 sampling stations in summer 2022. This lake is placed at 924 m a.s.l and has a triangular shape, covering 0.11 km² in surface. Maximum depth is equal to 24 m, and water is fed via subsurface flow across a moraine ridge by the Superiore Lake, as the systems are connected underground.

Diatom community is characterized by high presence of *Achnanthidium* specimens (28-55% in the five stations). A high diversity of species was observed within the genus *Achnanthidium*: 19 species were identified, some of which have a wide distribution in Europe according to AlgaeBase (e.g. *A. microcephalum*, *A. affine*, *A. straubianum*, *A. lineare*, *A. pyrenaicum*). With a less limited distribution are *A. pavense*, recently described for a lake in France, *A. dolomiticum*, *A. strenzkei* and *A. zhakovschikovii*. Most species are typical of oligotrophic environments (i.e. *A. neomicrocephalum*, *A. strenzkei*), while others have a wider ecological range (e.g. *A. affine*, *A. nanun*)

Other species of Achnanthidiaceae comprise *Eucocconeis* (1 species), *Gliwiczia* (1), *Platessa* (4) *Planothidium* (5), *Psammothidium* (1) and *Rossothidium* (1).

EPIL taxon list does not include some of the identified taxa which are therefore excluded from the calculation.

FROM SODA LAKES TO HOT SPRINGS AND FRESHWATERS: DIATOM BIODIVERSITY PATTERNS IN A LOW-IMPACTED AREA OF THE SONGWE RIVER BASIN (SOUTHERN TANZANIA)

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The Songwe River basin in southern Tanzania harbors a remarkable diversity of aquatic habitats within a short geographical distance (~40 km), ranging from a hypersaline, hyperalkaline soda lake and acidic hot springs to brackish to freshwater floodplain lagoons and rivers. This area remains minimally affected by anthropogenic impact, offering a unique opportunity to study diatom flora and the assemblage's composition under extreme natural environmental gradients.

Environmental characterization revealed that salinity and pH are the primary drivers of diatom community composition. Conditions ranged from the extreme values recorded at Lake Magadi (pH 9.9, conductivity 90 mS/cm) to intermediate brackish environments such as the Lutururа River (pH 9, conductivity 13 mS/cm), and near-neutral freshwaters in the Zira River (pH 7.4, conductivity 450 µS/cm), with the most acidic conditions found at the Tete and Songwe hot springs (pH 6.6).

Diatom species richness showed a clear negative relationship with increasing pH and salinity. Lake Magadi supported low species richness, dominated by taxa typical of soda lakes, including Anomoeoneis sphaerophora, Craticula halophila, Rhopalodia gibberula, and Nitzschia sigma, consistent with previous studies on alkaline soda lake diatom floras. Hot springs were characterized by Mastogloia, Pinnularia, Brachysira, and Craticula buderi, while river communities were dominated by Gomphonema, Achnanthidium, Planothidium, and Cymbella. Despite low local species richness in extreme habitats, regional diversity across the basin was substantial.

This study highlights how a small, anthropogenically undisturbed area can concentrate exceptional diatom diversity through habitat heterogeneity and extreme physicochemical gradients, contributing to our understanding of diatom ecology and biogeography in East African inland waters.

SEASONAL AND SPATIAL BLOOM DYNAMICS OF DIATOMS IN THE WESTERN MEDITERRANEAN SEA (1994–2023)

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Spatial and temporal variability patterns of seven diatom genera — *Chaetoceros, Guinardia, Leptocylindrus, Nitzschia, Pseudo-nitzschia, Rhizosolenia*, and *Thalassiosira* — were analyzed in order to assess the bloom dynamics. A long-term time series (1994–2023, n=698 samples) obtained across 17 sampling zones in the Alboran Sea and Levantine basin (western Mediterranean) was analyzed. Bloom thresholds were defined as the 75th percentile of each genus' abundance distribution.

Genera showed different seasonal patterns of abundance, consistent with the significant influence of season on community composition (PERMANOVA F=6.33, R^2=2.79%, p=0.001). *Chaetoceros* and *Thalassiosira* peaked in spring, while *Guinardia, Leptocylindrus,* and *Nitzschia* peaked in summer. *Pseudo-nitzschia* and *Rhizosolenia* displayed broader multi-seasonal distributions with maximum density in summer and notable presence extending into autumn. All genera were strongly surface-associated, with over 62.4% of positive observations in the upper 10 m of the water column.

Significant but weak spatial structuring was observed between the two basins (PERMANOVA F=4.56, R^2=0.67%, p=0.001). The Alboran Sea was dominated by *Leptocylindrus* and *Pseudo-nitzschia* (29.9% and 26.7% mean relative abundance), while *Chaetoceros* dominated the Levantine basin (42.0%). Bloom frequencies also differed markedly: *Chaetoceros* and *Guinardia* bloomed more frequently in the Levantine basin (39.6% and 37.4% respectively), whereas *Nitzschia* and *Pseudo-nitzschia* bloomed more consistently in the Alboran Sea (27% and 26.9%).

A key finding was the strong and synchronous co-occurrence of *Chaetoceros* and *Pseudo-nitzschia* (Jaccard=0.577; Spearman ρ=0.717, p<0.001). Cross-correlation analysis confirmed simultaneous blooms (lag=0 months), suggesting shared environmental drivers. Logistic regression showed that *Chaetoceros* bloom status is strongly associated with *Pseudo-nitzschia* bloom occurrence (AUC=0.925; NPV=95.3%), supporting its potential use as a co-indicator of HAB risk in the region.

These results reveal distinct and recurring bloom strategies among western Mediterranean diatoms. While spatial and seasonal structuring was statistically significant but weak overall, a robust and consistent association was observed

between *Chaetoceros* and the toxigenic genus *Pseudo-nitzschia*, with implications for long-term monitoring and early warning systems.

ECOHYDROGEOLOGICAL CHARACTERIZATION OF SPRING ECOSYSTEMS USING BENTHIC DIATOMS: IMPLICATIONS FOR MONITORING AND CONSERVATION IN THE EMILIA-ROMAGNA REGION (ITALY)

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Springs are key ecosystems hosting highly specialized communities and biodiversity hotspots worldwide, yet they remain under-recognized and increasingly threatened, leading to a long-time ongoing silent global crisis of spring demise. This study focuses on mountain springs in the Emilia-Romagna Region (Northern Apennines), where diatoms were used as primary bioindicators to investigate ecological variability across different spring types.

A total of 25 springs were selected across different ecohydrogeological settings, where we identified five main strategic zones/main aquifer types to support spring conservation in the Emilia-Romagna Region: ophiolithic ridge, turbidite sandstone ridge, Triassic karst, shallow-marine arenite springs, and *fontanili* (semi-natural lowland springs typical of the Po floodplain). Benthic diatoms were sampled from the main substrates (epilithon, epipelon, and epibryon) together with hydrochemical parameters.

The results highlight clear differences in diatom assemblages among both spring types and substrates. Strong relationships emerged between diatom composition and key environmental gradients, particularly mineralization, temperature, and discharge stability. These findings confirm the effectiveness of diatoms as bioindicators of spring ecological status and provide a robust basis for improving the classification, monitoring, and conservation of spring ecosystems in the Emilia-Romagna Region.

The main goal is to keep using springs as sentinel environments of the effects of environmental change and land-use, in a time of ever-increasing threats due to climate change effects and augmented exploitation of aquatic ecosystems.

DIATOM COMMUNITIES IN MOUNTAIN RIVERS HOSTING AQUACULTURE ACTIVITIES: A CASE STUDY FROM TRENTINO (NORTHERN ITALY)

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We investigated benthic diatom communities to assess alterations in water quality of streams receiving trout farm effluents. Diatom samples were collected from 22 sites upstream and downstream of 11 trout farms during summer 2024 in the Province of Trento, which, with ~60 farms, represents one of the main salmonid-producing areas in Italy. Aquaculture can alter water quality through the release of nutrients, organic matter, chemicals, and pharmaceuticals, potentially resulting in shifts in diatom community composition.

Using light microscopy, we identified preliminary 137 diatom taxa, belonging to 41 genera, with taxonomic richness ranging from 15 to 41 taxa per site. Assemblages were dominated by *Achnanthidium* (up to 86% relative abundance), followed by *Cocconeis*, which showed local dominance (up to 53%). Representative LM plates are provided for dominant or taxonomically relevant taxa, supporting the documentation of the assemblages. Furthermore, we address challenges regarding the identification of taxonomically complex taxa and their inclusion in lists used for indices calculation. These include small species within the *Achnanthidium minutissimum* complex, intermediate forms between *A. pyrenaicum* and *A. delmontii* (difficult to assign to either species), and taxa within the *Cocconeis* genus, some of which currently lack sensitivity (s) and indicator (v) values for the IPS (Specific Pollution Sensitivity Index) and TI (Trophic Index-Rott) indices. The Intercalibration Common Metric Index (ICMi), a WFD-compliant metric combining IPS and TI values, classified most stations as having at least a "Good" ecological status. Moreover, diatom guild analysis revealed a dominance of low-profile taxa, typical of low-nutrient and fast-flowing environments. Nevertheless, a longitudinal decrease in low-profile taxa was generally observed from upstream to downstream sites and a reduction in water quality was detected downstream of five trout farms.

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ASSESSING THE INTERPLAY BETWEEN HABITAT TOLERANCE AND COMPETITIVE PERFORMANCE ON MOUNTAIN MIRE DIATOMS

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Mountain mires are highly heterogeneous ecosystems composed of diverse microhabitats that support diatom communities with high species richness and numerous low-abundance taxa with restricted occurrence. Due to their sensitivity to environmental variation and strong interspecific competition for limiting resources, diatoms are well-suited model organisms for studying distribution patterns. Among environmental drivers, pH has been described as one of the major drivers shaping diatom species composition and distribution. Mountain mires are among the ecosystems with the widest pH ranges, making them ideal systems for assessing environmental tolerance and interspecific competition. We estimated the pH-based niche breadth and a performance index (Baas-Becking score) at both the regional scale and across three pH categories (<5.5, 5.5–6.5, and >6.5). The three pH categories were defined based on observed changes in diatom community composition and species richness along the gradient. Overall, species with broader pH tolerance, with ranges of up to 4.3 pH units, showed higher competitive ability at the regional scale. At the regional scale, *Achnanthidium minutissimum* emerged as the most competitive and widespread species, followed by *Sellaphora nigri* and *Gomphonema gracile*. Across pH categories, higher levels of interspecific competition were detected in acidic mires (pH <5.5), with *Eunotia fallax*, *E. nymanniana*, and *Frustulia saxonica* as the most successful taxa. At intermediate pH (5.5–6.5), competitive differences among species were less pronounced, although *A. minutissimum*, *S. nigri*, and *G. gracile* dominated. In more alkaline mires (pH > 6.5), *A. minutissimum*, together with *Caloneis tenuis* and *Navicula exilis,* exhibited the highest competitiveness. These results highlight the role of pH tolerance as a key driver of competitive dynamics and community structure in diatom mountain mires.

OBSERVATIONS ON FORMATION OF INTERNAL VALVES IN EDAPHIC NITZSCHIOID DIATOMS FROM ABANDONED MINING SOILS IN MURCIA, SPAIN

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Diatoms inhabiting terrestrial environments require specific adaptations to survive stressors that are typically absent in aquatic ecosystems, such as fluctuating moisture levels, intense UV radiation, and variable nutrient availability. Consequently, these organisms have evolved distinct morphological and physiological traits that enable them to persist in extreme conditions, allowing for the establishment of diatom communities even in arid habitats.

Internal valves are morphologically specialized, heavily silicified structures produced within vegetative cells following mitosis and unequal cytokinesis. Cells encased in these valves may function as dormant stages, requiring specific environmental triggers to germinate. The formation of internal valves is notably prevalent in certain genera, such as *Hantzschia*. In *Epithemia*, this trait has been proposed as a defining characteristic for a group of species adapted to harsh environments. Other genera develop craticular plates or conopea, which serve as mechanical barriers to mitigate desiccation. Furthermore, some species produce resting cells that are cytologically and physiologically distinct, designed to suppress metabolic activity and conserve energy until favourable conditions reappear.

In a study focusing on edaphic algal communities within abandoned mining soils in Portmán (Murcia)—a region characterized by an annual rainfall below 300 mm and a mean temperature of 20 °C—extensive *Vaucheria* growths were sampled. Associated cyanobacteria and nitzschioid diatoms were subsequently isolated in culture. Frequent internal valve formation was observed in these cultures, prompting experiments to evaluate the effects of desiccation. This process was analysed using confocal laser scanning microscopy (CLSM) and field-emission scanning electron microscopy (FESEM), followed by an assessment of potential biotechnological applications.

P72 – Diatoms in extreme environments and neglected habitats

DIATOMS OF THE HYPERSALINE ENVIRONMENT OF PAG SALTERN, CROATIA

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Salt pans are specific environments of the Mediterranean, where, due to weak tides, high salinities, and specific meteorological conditions, traditional ways of salt production and harvesting are still ongoing. These hypersaline environments are characterised by extreme conditions, including high salinity, limited oxygen availability, and intense solar radiation. A notable example in Croatia is Pag Saltern, one of the oldest Mediterranean salterns on the Island of Pag. Situated in the Northern Dalmatia region, the saltern has a distinctive climate shaped by hot summers and the year-round strong influence of the northeasterly wind Bora.

The project aims to improve and optimize salt production at Pag Saltern, while reducing risk levels during the traditional crystallisation process. Research focuses on the microbial communities inhabiting the salt ponds. Within this highly species-selective environment, diatoms proliferate markedly during specific successional stages, alongside the expected green alga *Dunaliella salina*. Our goal is to characterise the highly adaptive diatom species across a salinity gradient of accumulation, evaporation, and crystallisation ponds.

The preliminary research conducted in August 2025 using light microscopy (LM) identified a distinct diatom assemblage along the salinity gradient. At lower salinity levels (≈ 59.7), species from several genera such as *Achnanthidium*, *Achnanthes*, *Amphora/Diplamphora*, *Campylodiscus*, *Cocconeis*, and *Mastogloia* were recorded. In contrast, higher salinity levels (≈ 203.3) were characterized by the presence of genera such as *Encyonema*, *Fragilaria* sensu lato, *Halamphora*, *Navicula*, *Nitzschia*, *Tetramphora*, *Staurophora*, and *Dickieia*.

Future research will focus on species-level identification using scanning electron microscopy (SEM) to extend the initial genus-level findings. These findings advance current knowledge of Mediterranean diatom diversity in still poorly characterized hypersaline environments, reveal potentially undescribed and endemic taxa shaped by strong environmental filtering in extreme habitats, and highlight the need to protect these systems under ongoing climate-driven changes in salinity regimes.

DIATOM DIVERSITY ALONG THE QUEBRADA–BOFEDAL–SALAR CONTINUUM OF ANDEAN SALARES (CHILE): ENVIRONMENTAL GRADIENTS AND CONSERVATION IMPLICATIONS UNDER LITHIUM MINING PRESSURE

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Endorheic Andean basins are structured as interconnected Salar–Bofedal–Quebrada (Salt lake–Wetland–Creek) systems, where strong environmental gradients shape biological communities. Diatom assemblages were surveyed across this continuum in three salares of northern Chile: Pedernales, Maricunga and Punta Negra. Although the diatom flora has been thoroughly studied in several Andean Salares, this is the first study to analyse the three habitats at the basin scale with an integrated community ecological approach.

Water flows downslope from Quebradas to Bofedales and finally into the Salar, with a continuous increase in conductivity and dissolved salts toward the endorheic salt lake, where salinity is extreme. These longitudinal gradients operate under harsh high-altitude conditions (3300–5000 m a.s.l.), including intense ultraviolet radiation, strong daily temperature fluctuations, and permanent water scarcity in a hyper-arid climate. As a result, biodiversity is largely restricted to the few aquatic ecosystems present in the basin, which function as ecological refuges within an otherwise desert landscape.

Diatom assemblages differ clearly among the three biotopes. Salinity and pH are the main drivers of diatom community structure. Salar lagoons host halophilic communities dominated by Halamphora species (notably *H. atacamae* and *H. atacamana*), *Craticula buderi*, and saline Navicula taxa such as *N. salinicola* var. *boliviana* and *N. atacamana*. Bofedales are characterised by communities dominated by Denticula species (e.g. *D. valida*), sharing several taxa with the Salar. In contrast, Quebradas support the most distinct assemblages, with dominance of *Pseudiostaurosira* cf *brevistriata* and frequent occurrences of

Pinnularia, *Achnanthidium minutissimum* and Encyonopsis, under conditions of flowing water and daily freeze–thaw cycles.

Although local richness is low, regional diversity across the integrated basin is high. Documenting this diversity is critical, as lithium mining—already affecting Pedernales and Punta Negra—poses an increasing threat to the biodiversity of this fragile Andean system.

EXPERIMENTAL EVIDENCE OF THE DRIVING ROLE OF PHYSICAL CONSTRAINTS IN REGULATING DIATOM SEASONAL DEVELOPMENT IN HIGH ALTITUDE ALPINE STREAMS

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In the early 2000s, a conceptual model based on field evidence was proposed to explain the seasonal growth of biofilm in Alpine streams fed by glaciers. The model identified the milder combination of physical and hydro-chemical stream conditions typical of late summer /autumn as the driver of the development stage of biofilm, called Window of Opportunity (WO), during this period. A secondary WO can irregularly occur in late spring/early summer, depending on interannual hydrological variability, especially on persistence of the snow cover in spring. This WOs occurrence is expected to change due to the ongoing deglaciation and changing snowfall and rainfall patterns occurring in the European Alps.

However, the WO conceptual model only explains the seasonality in glacier-fed streams and has been scarcely verified in the field since its development. From June to October 2024, we conducted a field experiment in a high-elevation area of South Tyrol (Lazaun, Italy). We selected streams with different origins: glacier, rock glacier (permafrost landform), and till (millennia old glacial deposit). Water temperature and stage, as well as underwater light intensity were recorded with dataloggers every 15 minutes. Concentrations of major ions, trace elements, and algal nutrients were determined on monthly samples, as well as the abundance per unit area of epilithic diatoms on natural and artificial substrates.

Water discharge emerged as the major constraint of biofilm development in the rock glacier stream influenced by permafrost thawing, while mineral turbidity and light availability hindered diatom development in streams fed by glacier melt and groundwater (till). Unexpectedly, temperature and nutrient variability did not influence biofilm development in the investigated streams.

DIVERSITY OF EPILITHIC DIATOMS IN ALPINE HEADWATERS

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Alpine headwaters are critical ecosystems that sustain millions of people through the provision of drinking water, hydropower, and key ecosystem services including those connected with tourism. Their environmental settings and high ecological value make them particularly vulnerable to climate change, with cascading effects on both ecosystem integrity and human well-being. Furthermore, due to their remoteness and their small dimensions, mountain headwaters are rarely included in monitoring programs, and little data is available to evaluate their status and evolution in the present context of environmental changes.

The Alpine Space project WATERWISE (2024-2027) aims at developing integrative tools for assessing the vulnerability of Alpine headwaters by jointly considering water quantity, water quality, biodiversity, and socio-economic aspects. A central component of the project is the continuous exchange of knowledge with local stakeholders, incorporating their perceptions and management needs on biodiversity conservation into a bottom-up approach to support the design of effective and sustainable strategies.

As a part of the biodiversity assessment framework, we investigate epilithic diatom communities across eight pilot catchments in the Alpine region. The study sites represent a wide range of hydrological regimes, i.e. from glacier-fed systems to snow- and rain-fed streams, as well as from groundwater- to permafrost-influenced environments, spanning diverse geological substrates.

This poster presents preliminary results of the analysis of samples collected from the study sites during 2025, addressing water chemistry and the composition of epilithic diatom communities. We include the concentration of key trace elements (e.g., heavy metals) that can be used as proxies of cryosphere degradation. We particularly focus on the morphological diversity of the genera *Achnanthidium*, *Gomphonema*, *Encyonema* and *Cocconeis*, including populations that may potentially represent species new to science.

P76 – Diatoms in extreme environments and neglected habitats

DIATOM DIVERSITY IN THE HYPERSALINE KUYALNYK ESTUARY (NORTH-WESTERN BLACK SEA COAST, UKRAINE)

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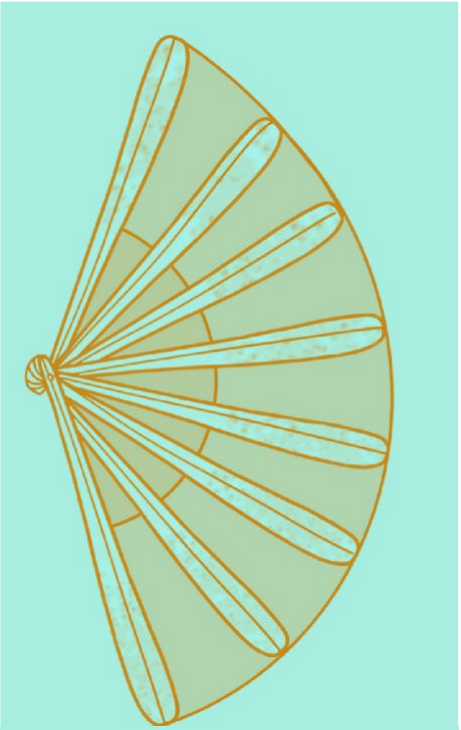
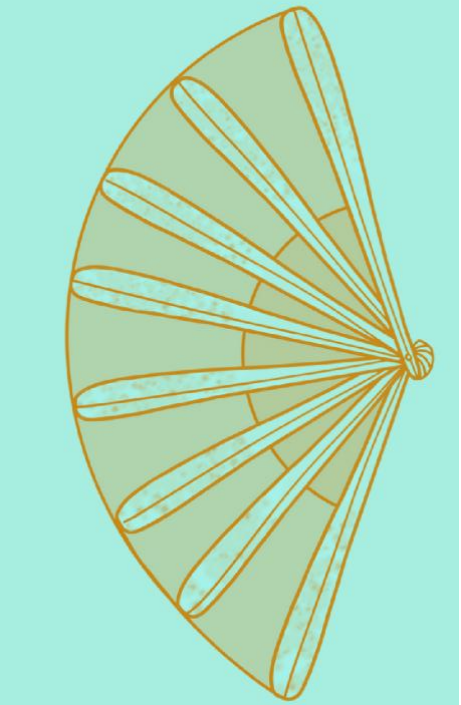
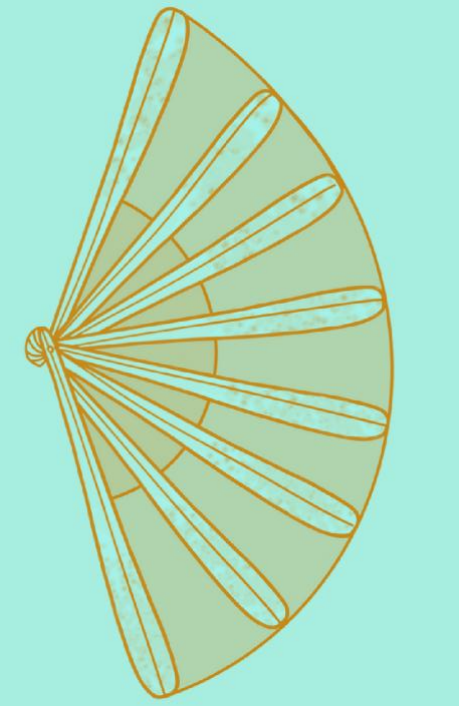
Kuyalnyk Estuary is a hypersaline liman with limited water exchange and cyclic hydrobiological and hydrochemical regimes determined by the alternation of high-water and low-water periods throughout its existence. Long-term ecological monitoring has been carried out in previous studies (Pogrebnyak, 1949, 1965; Ennan et al., 2015; Zaitsev, 2015). In different years, the salinity of the water across the estuary varied within the range of 49.9–248‰ (Ennan et al., 2022). Kuyalnyk Estuary is part of the National Nature Park "Kuyalnytskyi," which was established on January 1, 2022. The unique ecosystem of the Kuyalnyk liman is currently threatened by climate change, pollution, and the consequences of war. Pumping seawater from the Black Sea coast remains the only way to prevent the final disappearance of this unique reservoir. Processing of literature data from 1931–2017 showed that over the long history of research, 201 taxa of diatom species have been recorded.

The material for this study consisted of samples collected in the summer of 2025 and the spring of 2026. During the sampling, the parameters of temperature, pH, salinity, conductivity and mineralization were measured. The aim of the investigation was to search for new records and to confirm the presence of rare and endemic diatom communities that have formed under extreme environmental conditions.The distribution of species across different sampling stations was uneven. Within a wide temperature range, that is, in all seasons, only seven diatom species were recorded: *Cyclotella meneghiniana* Kütz., *Halamphora coffeiformis* (C. Agardh) Levkov, *Navicula gregaria* Donkin, *N. veneta* Kütz, *Platessa salinarum*, *Pleurosigma elongatum* W. Sm., *Rhoicosphenia abbreviata* (C. Agardh) Lange-Bert.







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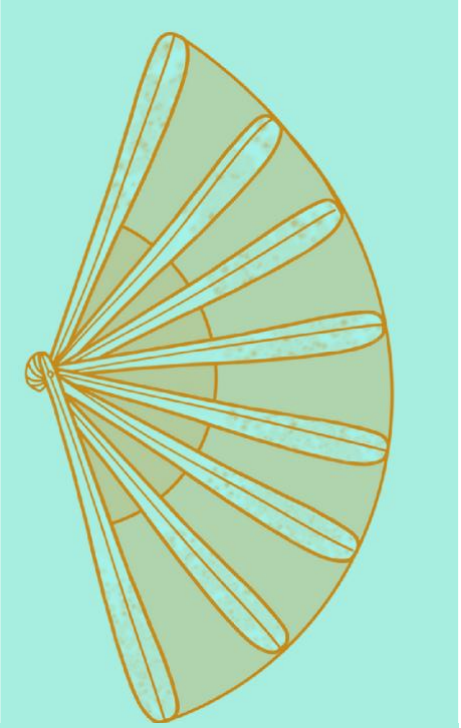

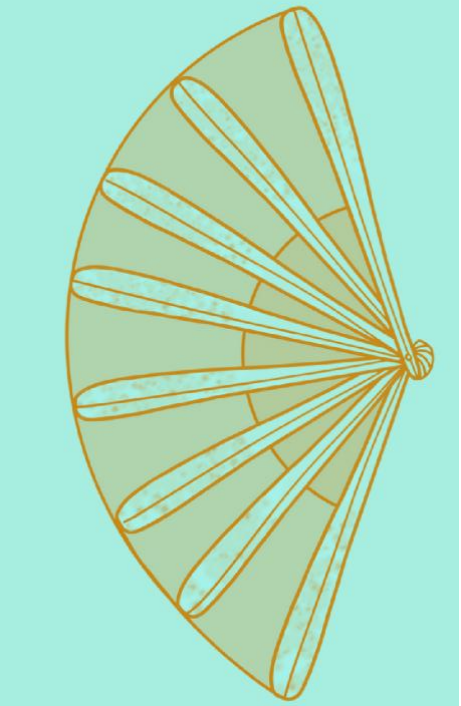

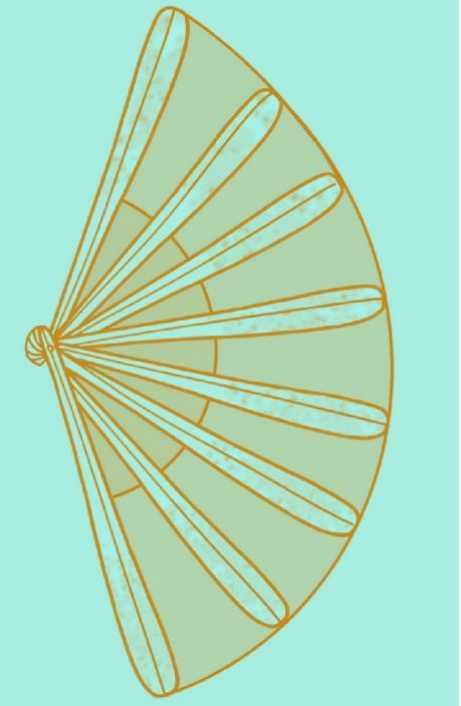

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